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[OFFICIAL NOTICE.]

### October Meeting, Society of Gas Lighting.

OFFICE OF THE SECRETARY, Oct. 6, 1898.

The October meeting of the Society of Gas Lighting will be held in "The Arena," No. 39 West 31st street, New York city, at 3 P.M. of the 13th inst.

FRED. S. BENSON, Secretary.

[OFFICIAL NOTICE.]

### Annual Meeting, American Gas Light Association.

OFFICE OF THE SECRETARY, MONTCLAIR, N. J., Sept. 6, 1898.

There will be an annual meeting of the American Gas Light Association held at Niagara Falls, N. Y., on Oct. 19, 20 and 21, 1898.

The meeting will be called to order by the President, Joseph B. Crockett, of San Francisco, Cal., at 10 A.M., on Wednesday, Oct. 19, in the meeting hall at the International Hotel, the headquarters.

The most satisfactory quarters are always obtained by writing in advance to the hotel people, and in doing so a reply should be requested, for which a self-addressed, stamped envelope should be inclosed, as misunderstandings may thereby be averted.

The International Hotel is conducted on the American plan, and rates are as follows:

Large parlors on first floor, $3.50 per day; all rooms on second and third floors, $3 per day; rooms with bath, $4 per day. At that season of the year we will be able to have the whole house.

The meeting hall will be on the parlor floor of the International Hotel; thus the headquarters and hall will be in the same building.

The roll call will be made by means of the door card system. Each member upon entering the hall for the first time will at the door receive a special card upon which he will find his name, address, etc., as it appears on the Secretary's books, and such card should be corrected and given to the doorkeeper. Members in attendance should attend to this very carefully, as these cards are used immediately after the meeting for correcting the annual membership list. Visitors will please hand to the doorkeeper their personal cards.

A blank form of application for membership accompanies this circular. More can be obtained of the Secretary.

Remember, all applications must be in the Secretary's hands by Oct. 9, at the very latest, otherwise they will not be acted upon at this meeting.

The list of papers to be read at the meeting is as follows:

"The Effect of the Depth of Fire upon the Practical Efficiency of a Water Gas Generator," by Mr. J. M. Rusby, Jersey City, N. J.

"Notes on Mains and Main Laying," by Mr. Walton Forstall, Philadelphia, Pa.

"The Loss of Illuminating Power of 25 to 30-Candle Gas when Mixed with Air," by Dr. E. G. Love, New York city.

Another paper is promised, the title and authorship of same to be announced later on.

In addition to the above there will be short topics by Mr. H. L. Doherty, Madison, Wis., Mr. E. G. Cowdery, Milwaukee, Wis., Mr. H. L. Rice, Norfolk, Va., and Mr. Irvin Butterworth, Columbus, O.

In accordance with the action taken by the Council and the Association last year, the Beal Medal will be awarded to the author of the best paper presented at this meeting; the question of which is best to be decided by a committee of three past-Presidents, appointed by the President.

All questions for the Question Box should be sent to the Secretary as soon as possible, in order that they may be printed in the next circular before the meeting, thereby insuring their discussion.

During the days of the meeting all announcements will be posted on the bulletin board in the meeting room. All members are warned to take notice thereof accordingly.

All members attending the meeting are particularly requested to wear their membership badges in plain sight, thereby greatly aiding the officers of the local committee in their work by affording a ready means of recognition.

In order that the Year-book containing the report of this meeting may be published and issued to the members immediately after the meeting—

Notice is hereby given, that if any of the speakers at this meeting desire to correct their remarks before they are printed, they will be given an opportunity before leaving Niagara Falls, but not after. The stenographer will have typewritten copy of the principal discussions prepared at the headquarters between the sessions of the meeting, and all those who desire to correct their remarks must notify the Secretary at the close of the session at which such remarks are made, as all the reports will be turned in to the printer immediately after the adjournment of the meeting.

Special rates for transportation have been granted (viz., full fare going and one third fare returning by the same route) by the several passenger associations named and under the conditions noted :

The Trunk Line Passenger Committee, covering the territory west of New England and east of Niagara Falls, Buffalo and Salamanca, N.Y.; Pittsburg, Pa.; Bellaire, O.; Wheeling, Parkersburg and Charleston, W. Va.

The New England Passenger Association, covering nearly all of the lines in the New England States.

The Central Passenger Association, covering the territory bounded on the east by Pittsburg, Salamanca, Buffalo and Toronto; on the north by the line of and including points on the Grand Trunk Railway from Toronto to Port Huron, thence via Lakes Huron and Michigan to the north line of Cook county, Illinois ; on the west by the west line of Cook county and the Illinois and Mississippi rivers, to Cairo, including Burlington, Keokuk, Quincy, Hannibal and St. Louis ; and on the south by the Ohio river, including points on either side of that river.

The Southeastern Passenger Association, covering the territory south and west of the Virginias and south and east of the Ohio and Mississippi rivers, and the Western Passenger Association, covering the territory west of and not including Chicago, Peoria and St. Louis, in other words, the territory west of that of the Central Association, have refused to grant the rates. Members from these territories should buy tickets from starting point to the nearest or most convenient point in the territory of any of the Associations granting the reduced rates, and at such point purchase tickets through to Niagara Falls and obtain a certificate.

The following extracts from the regulations of the railroads are cited for the information of the members. The special rates are granted subject to these regulations :

*First.* The reduction is conditional on there being an attendance at the meeting of not less than 100 persons holding certificates.

*Second.* Each person to obtain the excursion rate must purchase a first-class ticket (either limited or unlimited) to the place of meeting, for which he will pay regular fare, and upon request the ticket agent will issue a printed certificate of purchase of the standard form. Agents at all important stations are supplied with certificates.

*Third.* If through tickets cannot be procured at the starting point, purchase short-trip ticket to the most convenient point where such through ticket can be obtained, and there purchase through to place of meeting, requesting a certificate from the ticket agent at the point where each purchase is made.

*Fourth.* Tickets for the return journey will be sold by the ticket agent at the place of meeting at one-third the highest limited fare only to those holding certificates, signed by the ticket agent at point where through ticket to place of meeting was purchased, and countersigned by signature written in ink by the Secretary of the Association, certifying that the holder has been in regular attendance at the meeting.

*Fifth.* No reduction of fare will be made on the return passage if the going ticket is purchased more than three days before the opening date of the meeting ; except that when meetings are held at distant points to which the authorized limit is greater than three days, tickets may be purchased before the meeting in accordance with the limits shown in regular tariffs.

*Sixth.* Certificates are not transferable, and return tickets secured upon certificates are not transferable. The transfer of any such is liable to prevent the securing of reduced rates for future meetings.

*Seventh.* The certificate of agent at starting point, duly endorsed by Secretary of Association, must be presented to ticket agent at place of meeting, within three days (Sunday not reckoned) after adjournment of meeting. The return ticket will be for the line or lines covered by the going ticket.

*Eighth.* No refund of fare will be made on account of any person failing to obtain a certificate.

*Special.*

If a sufficient number of subscriptions are obtained, the social programme will be as follows : Wednesday evening, reception and hop ; Thursday evening, banquet to which ladies will be admitted on equal footing with the gentlemen ; Friday evening, informal hop ; Wednesday and Thursday, carriage drives for the ladies ; Friday, visit the Niagara Falls power house and other places of interest, and trolley ride down Gorge Route to Lewiston and return.

Tickets admitting members and friends to these entertainments can be had for $5 each. If you wish to join in them please sign inclosed card and return to the Secretary at once. It will be necessary to have at least 100 subscriptions.

Be sure to obtain your railroad certificate when buying your ticket for Niagara Falls, as the greater the number of certificates handed in, the easier it is to get the reduction in rates for future meetings.

Apply for tickets and certificates at least 30 minutes before train time.

Each person must sign his own certificate at time of purchasing for Niagara Falls.

Be sure to hand the Secretary your certificate as soon as you reach the headquarters.

Apply for return ticket at least 30 minutes before train time, and have your certificate with you.

Any person, ladies included, attending the meeting, is entitled to the reduced rate from the territories named.

Members will please hand their certificates to the Secretary, or his clerk, upon arrival at place of meeting. If there are 100 members present, holding certificates, each certificate will then be properly indorsed and handed back to owner, before adjournment.

*Extracts from the Constitution.*

Sec. 12. Application for active membership, or for associate membership, or for transfer from associate to active membership, must be received by the Secretary at least 10 days prior to the meeting at which the application is acted on.

Sec. 51. No member who owes two years' dues shall be entitled to vote, or to participate in the deliberations of the Association, or to receive a copy of the proceedings.

Sec. 52. Any member whose dues shall remain unpaid for a term of three years may be dropped from the roll of membership by a vote of the Council. ALFRED E. FORSTALL, Secretary.

## BRIEFLY TOLD.

THE EDUCATIONAL FUND PRACTICALLY ASSURED.—With much satisfaction we announce that the proposed fund for the maintaining of the educational work of the American Gas Light Association, begun in 1895, and so well and unselfishly carried out since by Mr. Walton Clark and his committee associates, is practically assured. References to this fund, and to the fair equity of subscribing thereto, have been made in the JOURNAL since the receipt by us of the Special Committee's circular notification (bearing date of June 2, 1898), respecting the fund plan therein formulated. Our last specific reference to this fund was made September 5th, when it was reported that the pledges handed in were sufficient to guarantee an income of $700 per year for the 5 year term proposed. Since then the fund raising committee (Messrs. A. C. Humphreys, Chas. H. Nettleton and Geo. G. Ramsdell) has labored not in vain, as the following list of pledged subscriptions shows :

| Subscriber. | Total Amount Pledged. | Amount per Year Through 5-Year Period. |
|---|---|---|
| Akron (O.) Gas Light Company | $75 | $15 |
| American Gas Company, Phila., Pa | 1,000 | 200 |
| American Gas Light Journal | 125 | 25 |
| Auburn (N. Y.) Gas Light Company | 50 | 10 |
| Austin (Tex.) Gas Light and Coal Company | 50 | 10 |
| Barker, Chas. W | 10 | 2 |
| Blodget, C. W., Brooklyn, N. Y | 50 | 10 |
| Clark, Walton, Phila., Pa | 600 | 120 |
| Cleveland (O.) Gas Light and Coke Company | 500 | 100 |
| Collins, C. R., Seattle, Wash | 10 | 2 |
| Crisfield, J. A. P., Savannah, Ga | 10 | 2 |
| Derby (Conn.) Gas Light Company | 100 | 20 |
| Dunbar, J. W., New Albany, Ind | 50 | 10 |
| Equitable Gas and Electric Co., Utica, N. Y | 10 | 2 |
| Humphreys & Glasgow, New York and London | 1,000 | 200 |
| Miller, A. S | 125 | 25 |
| Nettleton, C. H., Derby, Conn | 125 | 25 |
| Norwich (Conn.) Gas Light Company | 125 | 25 |
| Old, G | 25 | 5 |
| Sherman, F. C., New Haven, Conn | 20 | 4 |
| Turner, Thomas, Charleston, S. C | 20 | 4 |
| United Gas Improvement Company, Phila., Pa. | 5,000 | 1,000 |
| Vanderpool, Eugene, Newark, N. J | 500 | 100 |
| White, W. H., New York | 100 | 20 |

Itemizing the above, as to the gross sums, the subscription goes for a single year only, but the second column shows the amount that the subscription covers when spread over the 5-year period. Of course, those who put down at once the lump sum make it all the easier to secure the desired result for the five years. The cause is worthy of aid from all gas men, and those who wish to add their names and sums to the educational cause should without delay forward their pledges to Mr. A. C. Humphreys, 31 Nassau street, New York.

NOTES.—Important recent changes in the management of the Standard Gas Light Company, of New York, may be thus summarized: Mr. W. G. Hoyt succeeds Mr. F. McKeige in the dual position of Treasurer and Secretary, and Mr. George E. Woods adds to his duties as Chief Engineer those of General Superintendent. We understand that Mr. McKeige has gone into the railroad business.——The net price of gas in the Jersey City (N. J.) district, which territory includes the Bayonne and Greenville divisions, is to be placed at $1.25 per 1,000 cubic feet, on and after December next.——It is understood that many gas meters are being bought for New York city account.

## Something from the Proceedings of the 38th Annual Meeting of the German Association of Gas and Water Engineers, held at Nuremberg, June 29th to July 2d.

[Abstract from the *Journal fur Gasbeleuchtung*, by MR. F. EGNER.]

The Chairman of the Association, Mr. Körting, of Hanover, opened the session at 9:10 A.M., June 29th. After greeting the members and other participants, he expressed the hope that the meeting would benefit the Association and incite the profession to further efforts. After giving notice of some unavoidable changes of programme, the Chairman introduced Dr. von Schelling, who, as President of the District in which the city of Nuremberg is located, represented the Royal Government on the occasion. The Doctor made some complimentary and highly appreciated remarks, thanking the Association for the invitation to be present with them and commending the objects and aims of the Society, promising that he would follow the proceedings with much interest.

Then, the Mayor of the city (Dr. von Schu) addressed the meeting, and, after the manner of Mayors the world over, told the assembled gentlemen what a remarkable city Nuremberg was in the past, now is, and in the future may become. He also told them what a distinguished party the Association with the long name was thought to be by himself and fellow citizens, how its aims appealed to the sentiments of himself and the community, and how greatly honored they all felt, for the opportunity to lodge such a remarkably representative body of professional men. He did not tell any pleasant fibs about orders having been given the local police not to molest the visitors, in case any of them became hilarious and could not find the hotels again, as American mayors are wont to do; but, judging from Dr. Schu's address, he would be certain to grace a like position in any American city wherein he could be elected. Then, in a manner which could scarcely be surpassed by our own inimitable and esteemed Captain Harry White, Herr Körting replied to all the pretty speeches, with interest, and, after welcoming the honorary and other guests of the Association, presented a first rate address, taking as his principal topic the evolution of the gas industry during the recent years, referring especially to the great advantage to gas lighting derived by the notable invention of the incandescent gas lamp by Dr. Karl Auer, Knight of Welsbach. In closing the address he proposed Dr. Auer for honorary membership in the Association, which proposal was adopted unanimously, with loud acclamation and signs of approval.

The next thing on the programme was a report from the "Commission for the Collating of Experiences with Inclined Retorts," which was presented by Herr Reissner, Manager of the municipal gas plants of the City of Berlin.

The Commission reported that the introduction of the inclines is progressing, and that the results in general are very satisfactory. It was noted that on the Continent 1,390 ovens[1] (benches) are in use, and 2,655 in course of erection; while in England 4,485 retorts are in use, and 2,500 are in course of erection. The Commission will continue to gather information on the subject, and will gladly receive any such which may be furnished.

Herr Grahn proposed that the Association appoint a standing committee, with special duties, consisting in taking such measures as might become necessary to insure to the gas industry the use of important patented inventions, the general introduction of which may be hampered with restrictive conditions.

The Chairman indicated that that subject would likely be considered by the Board of Directors in the near future.

Dr. Leybold (Hamburg) speaking on carbureted water gas, is reported as follows:

"The first generator for non-carbureted water gas in Germany was erected by Schiele, at Frankfurt, in 1881. It was examined by Bunte, and afterward also employed to produce carbureted water gas, using paraffine oils for the purpose; but the results obtained at that date were unsatisfactory. Carbureted water gas had its first extensive introduction in the United States; then in England. On the Continent its spread is still quite small, although the erection of works in the near future is to be expected."

He then ably recapitulated the well known advantages and disadvantages of carbureted water gas, but these we may omit here since they have been so well understood for a number of years on this side of the Atlantic.

Continuing, Dr. Leybold said: "Large gas works especially will be among the first to introduce water gas; mainly because, owing to the greater demand for gas in latter years, they have arrived at the limit of their producing capacity, and the necessary increase of generating power may be had most cheaply by the introduction of water gas. The raw material for the production of water gas is in the first place coke, which is most suitable when it contains an easily fusible slag. To produce 1,000 cbm. gas requires 560 kg. coke (28.6 pounds of coke per 1,000 cubic feet of gas). The carbureting material comes next. In England they use mostly Russian petroleum, though of late years American oil is also used. In Germany there is a customs duty of M. 7.50 per 100 kg. to be paid. Native carbureting oils can be had at M. 7.0 per 100 kg., so that although carbureting comes high, it is still possible with a 16-candle power water gas to compete with coal gas at these figures."[1]

At present the production of oil in Germany is so little above the demand that few gas works would find it possible to obtain the necessary quantity in that country. But it is hoped that a greater demand may lead to enlargements of the producing plants. The native carbureting oils are mostly produced in the distillation of Braun-coals and shales. There is some petroleum produced in Elsatia, but it is sold at a higher price even than the duty-paying American article. Of water gas processes, that of Lowe is most extensively employed. Dellwick's process and apparatus produce more water gas from a given quantity of coke than the other processes in use to date—viz., 2.5 cbm. of gas with 1 kg. of coke (24.96 lbs. of coke per 1,000 cubic feet of gas), but it is not suitable to carburet with heavy oils. Benzole will probably have to be used to do it.

Dr. Strache (Vienna) then spoke upon the latest progress made in lighting with water gas; but Dr. Strache's subject was water gas, either not at all or but slightly carbureted. In fact, he gave a description of his researches in that field and of his invention in that direction in particular. Respecting his process, which is a soft coal, water gas process, the Doctor said that after having distilled off the illuminating gas from the coals, this gas is passed through the water gas generator with the result that, instead of obtaining only 30 cbm. from the 100 kg. of coal, he gets, by reason of the decomposition of the methane, about 45 cbm. of gas; and then, by converting the residual coke into water gas also, he obtains an additional 140 cbm. of gas, according to the employment of the air and steam[2].

What these figures signify may be better understood by glancing at the following quotations from American sources:

Mr. Emerson McMillin, in 1887, proposed a mixed gas, composed of 10,500 cubic feet of illuminating coal gas; 12,500 cubic feet of straight water gas, and 36,800 cubic feet of producer gas, or 59,800 cubic feet of gas per ton of coal; and my impression is that Mr. McMillin used the 2,000 lb. ton standard instead of the 2,240 lb.; but at date of writing the writer is not sure of that. In 1888 Mr. Walton Clark proposed a fuel gas composed of 10,000 cubic feet of illuminating coal gas; using two-thirds of the residual coke for straight water gas, 19,350 cubic feet of the latter was produced, and the balance of the residual coke was converted into 37,000 cubic feet of producer gas, or a total of 66,350 cubic feet of combustible gas. Had the incandescent gas burner been *then* developed as it is *now*, both Mr. McMillin's and Mr. Clark's proposals might have caused the gas history of to-day to appear in a very different aspect—in the opinion of the writer.—F. E.

Returning to what Dr. Strache is reported to have said:

The larger the (his) apparatus used, the better will be the results in yield of gas from material employed; as, for example: In a large apparatus 0.53 kg. per 1 cbm. (equal to 33 lbs. per 1,000 cubic feet) is used, while in a small apparatus as much as 0.8 kg. per cbm. (equal to 50 lbs. per 1,000 cubic feet) is needed—meaning coke, of course.

After purifying the water gas it should not be permitted to come in contact with clean iron surfaces, hence all vessels through which the gas passes, including pipes, should be tarred or tinned. To give an odor to the gas, carbylamin is introduced. This gas is used exclusively with glow mantles (incandescent burners) which are manufactured for 25, 80, 100 and 150 candle power lamps. The consumption of gas is 1.2 to 1.7 liters per candle and hour with these burners.

This means that the gas consumption per candle and hour ranges from 73.23 to 103.74 cubic inches of gas; and that conseqnently a 25-

1. The ovens referred to above are probably all benches of 9's, or with 5 retorts per bench, for that is the number mostly erected there by preference.—F. E.

1. The above protective rate translated means about 5.68 cents duty per U. S. standard gallon, supposing a gallon of petroleum to weigh 7 pounds; while the price of the native product, viz., M. 7.0 per 100 kg., means about 5.27 cents per U. S. standard gallon. That is "Protection" with a vengeance.

2. The above results translated and adapted to our scales of comparison mean that Dr. Strache obtains, in the first place, 10,764 cubic feet of coal gas per ton (2,240 lbs.) of coal. By repassing this gas through his generator that quantity is increased to 16,146 cubic feet of (a no doubt inferior illuminating) gas. The final reduction of the coke to water gas adds 50,233 cubic feet to the lot; so that one ton (2,240 lbs.) of coal by Dr. Strache's process is claimed to produce all told 66,379 cubic feet of combustible, though not illuminating gas.

candle power lamp will require at the maximum rate only about 1½ cubic feet of gas.

Acetylene is entirely suitable, Dr. Strache claims, to carburet his gas, and when so used gives a beautiful white flame. Such a mixture would work greatly to the advantage of acetylene, if used as a diluent; since, for one thing, it would do away with the smoking of the flame. But in view of the much greater costliness for illumination, when acetylene in any form is used, although the carbureting may be done at the works or at the burner by any material, the Doctor can evidently not see the use of doing so unnecessary a thing in connection with his system, and he says so in effect.

Referring to the sanitary aspect of non-carbureted water gas the Doctor points to the fact that his process is in constant use at the General Hospital in the city of Vienna; and that there can be no danger from its poisonous properties, if used with ordinary caution, one of the requisites being to give the gas a distinct odor so an escape may be readily detected.

He also noted that with water gas used in connection with the incandescent burner less heat is emitted in proportion to the light given than with any other system of artificial illumination; and that there is much less danger from explosion than with any other gas. For instance, acetylene will explode violently when but 5 to 7 per cent. of air is mixed with it. Coal gas requires 10 per cent.; water gas, 12 per cent. After making some more general remarks relative to non-carbureted water gas, Dr. Strache, to fortify some of his statements, gave an interesting exhibition with burners, etc., etc., in practical use and operation.

Dr. Bunte then took the floor, and in giving some very interesting notes on water gas in general, said, with reference to the two previous papers, that after many earlier failures the manufacture and application of water gas was making substantial progress. The first apparatus in Germany was erected at Frankfurt, and investigated by him at the time. The result then was that of the total heat energy brought into the generator with the fuel, 45 per cent. was recovered in the gas produced, while 55 per cent. was lost. Now Dellwick was able, by reason of high air blast and shallow coke bed, according to his (Dr. Bunte's) personal examination, to recover 72 per cent. of the total heat energy of the fuel; 16 per cent. was lost in the hot blast, 8 per cent. by escaping gases, while 4 per cent. was lost by radiation and other causes. The recovery of heat lost in blowing up, was now abandoned in apparatus of even exceedingly simple construction. It was known that Dr. Strache succeeded in making water gas not only from good gas coals, but also from less valuable coal. The application of the Strache gas in the General Hospital of Vienna made a very favorable impression on the speaker, on the occasion of his visit there. That institution is lighted and heated entirely by means of this uncarbureted water gas, employing incandescent mantles in connection therewith for illuminating purposes. Continuing to speak on water gas, Dr. Bunte said that with mixtures of air the minimum limit of explosion was: For benzene, 2.5 per cent.; benzole, 2.7 per cent.; acetylene, 3.7 per cent.; illuminating coal gas, about 7.0 per cent.; synthetical water gas, about 9.7 per cent.; carbonic oxide alone, 17.3 per cent.; and commercial water gas about 12.0 per cent. Water gas was suitable for motor purposes, and for illumination in connection with incandescent mantles it was most excellent.

The illuminants composing a portion of ordinary gas no longer have the relative value they formerly had, and the more incandescent lighting increases the less will high candle power gas be called for. Consequently the time will come when less weight will be given to the candle power of gas, so that illuminating gas itself will no longer have to be produced, and it will be replaced with the much cheaper non-carbureted water gas.[1]

After the Chairman had thanked Dr. Leybold, Dr. Strache and Prof. Bunte for their speeches, Herr Liebetanz (Dusseldorf) spoke upon the future of acetylene and its relation to coal gas illumination. He said that up to May 1st of the present year, 1,700 apparatuses were in use for lighting purposes, with a total of 42,000 flames. This corresponded to an annual carbide consumption of about 5,208 tons, which did not include the 3,000 tons used yearly by the railroads for mixing with oil gas. Liability to explosion, purifying the gas and the cleansing of the burners were the most important questions to be considered with any system of acetylene lighting. On account of the very narrow slits necessary with acetylene burners to prevent smoking of the flame the gas pressure required must be about three times as great as with ordinary gas. The danger from explosion begins with the admission of about 3 per cent. of air, and it is desirable not to let the pressure in the apparatus get beyond 2 atmospheres to avoid explosion. Acetylene mixes well with other gases, especially with oil gas; but when competing with benzole in the enriching of coal gas it was not a success, because benzole was so very much cheaper for that purpose. It certainly never could compete with coal or illuminating water gas as a means of general illumination; but where these could not be had it would no doubt find extensive application.

Aulic Councilor, Dr. Bunte, then gave a lecture on "Liquid Air," in the course of which he said that the earliest attempts to liquefy gases were made by Faraday, who liquefied carbonic acid, ammonia and nitrous oxide. Natterer engaged in similar efforts, but even under the immense pressure equal to 3,000 atmospheres (one atmosphere equals 14.7 lbs. per square inch, nearly), he was unable to reduce some of them to a liquid form. Andrews found theoretically that it would be necessary to reduce the temperature of many gases before they could be liquefied, and advanced the idea of "the critical temperatures" at which only gases could be condensed; as, for instance, carbonic oxide to —140°; nitrogen to —146°; hydrogen to —234°. Cailletet, at Geneva, and Pictet, at Paris, were the first to liquefy air by means of first applying great pressure and then permit sudden expansion of the compressed air; but they only produced small quantities of the liquid, which remained so only a short time. Afterwards very low temperatures were attained, as low as —120°, by the use of liquid ethylene. At that temperature and under pressure, oxygen and nitrogen were liquefied in small quantities. Dewar, at London, succeeded in condensing all gases, recently including hydrogen. In 1895 Linde condensed air after an entirely different system, which depends upon the reduction of temperature caused by the rapid outflow of the previously compressed gases. The falling of pressure equal to one atmosphere causes a reduction of ½° C., hence a fall of 200 atmospheres means about —50° C. The Doctor explained the apparatus and its operation, showing, first, a compression to 16; then, to 200 atmospheres; then, the effect of the reduction of temperature in the manner previously mentioned. A portion of the gases was reduced to —140°, and then in rapidly expanding lost so much more in temperature that liquid air was evolved. One liter (61.0254 cubic inches) of liquid air can be produced per hour (in the apparatus described) with an expenditure of 3-horse power. The liquid air is stored in "Dewar" flasks, of which some were shown filled with liquid air produced the day before at Linde's manufactory, at Munich, and that had been brought to the meeting by Dr. Sieder. The "Dewar" flasks are vessels with double sides (so-to-speak, a flask within a flask), the space between the two being maintained at a vacuum, the sides of the vessels themselves being lightly silverplated, to retard the action of heat from the outside as much as possible. When liquid air evaporates it leaves an excess of oxygen in the remainder, so that by this method a liquid containing 75 per cent. of oxygen can be produced. When not perfectly pure, or when containing carbonic acid, the liquefied air will appear turbid, but can be made quite clear by filtering through filter paper. Quicksilver was frozen, and alcohol and ether were solidified in liquid air. A rose and a rubber hose were frozen so solid that they could be pulverized. By means of a blowpipe and gas and liquid air iron was melted and then burned, and lime brought to the highest incandescence.

At the conclusion of the lecture votes of thanks by the Association were given to the speaker, and to the Linde Ice Machine Company and to Dr. Sieder for the lecture as well as loan of apparatus used in same.

The second day of the meeting was devoted almost exclusively to water supply and kindred subjects, excepting a lecture by Chief Engineer Utzinger, of Nuremberg, on lighting closed apartments by means of electricity, which was received with applause and the thanks of the Association, expressed by the Chairman.

The third day's session was opened at 9:30 A.M., by the Chairman, and after listening to an interesting paper on the Diesel Motor (recently patented in the U. S.), by Chief Engineer Vogel, the Association went into executive session.

As the subjects under that heading will scarcely interest the readers of the JOURNAL, we may be pardoned for "by-passing" that portion of the proceedings, mentioning only that Herr W. von Oechelhaeuser, Director-General of the German Continental Gas Gesellschaft, who has many friends and admirers in America, was selected to succeed Herr Körting as Chairman of the Association. This is not Herr von Oechelhaeuser's first term as presiding officer of that distinguished Association of gas men.

The various commissions appointed to investigate a number of subjects in which gas and water engineers are especially interested were continued, and that on gathering information upon and collating expe-

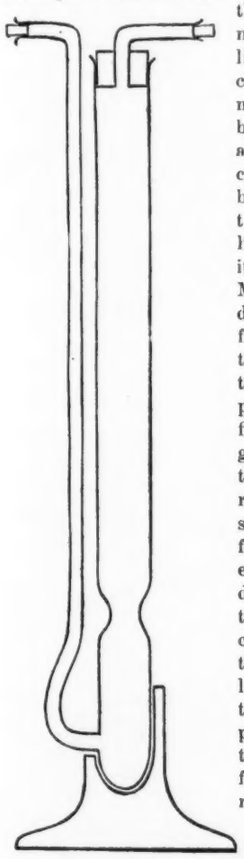
1. Dr. Bunte's views usually command respectful attention from those who are wise, and his opinions should have careful consideration; for he is acknowledged as a foremost scientist of our time.

riences with inclined retorts was increased by electing two new members.

The next annual meeting of the Association will be held at Cassel, to which the writer would add his humble opinion that at Cassel the model works designed and erected by Herr Emil Merz will alone make it worth the visit.

## A Convenient Form of Drying Tube.

At the last meeting of the British Association, Mr. A. Vernon Harcourt, F.R.S., having noted that a common method of drying gases was to pass them through a wash bottle containing sulphuric acid, and then through a U-tube filled with fragments of pumice moistened with the same liquid, declared that such arrangement increased the chance of leakage. The U-tube must be supported in an upright position, both when in use and afterwards, that the acid may not come in contact with the corks; if too much acid is poured in the bend becomes blocked by a plug of liquid; there is no means of telling when the acid has become less efficient by dilution; nor is it easy to recharge the tube with fresh acid. Mr. Harcourt then submits that the form of drying tube here shown avoids these defects. It is at once wash bottle and drying tube. It has one cork and stands upright; the pumice can be well drenched with sulphuric acid, the excess draining down and filling the lower part (through which the gas bubbles) to a convenient height; dilution announces itself, and the acid is easily renewed. The shape is that of a Gay-Lussac burette with a constriction about 2 inches from the bottom. A piece of pumice, large enough to block the constriction, is first dropped in, and the tube is filled to near the top with small fragments of pumice. In charging with acid care is taken not to wet the upper part of the tube; next day the level of the acid in the lower part of the tube is marked with a strip of gummed paper. The small side tube which enters the large tube near the bottom is the inlet for gas; when the moisture absorbed has raised the level of the acid about 2 m.m. above the mark, the acid in the lower part is poured off through the small tube, and fresh acid is poured in through the pumice. The inlet and outlet tubes are made of the same height, so that a series of similar drying tubes may readily be joined together.



## The Benier Gas Engine and Producer.[1]

The use of gas engines as a source of power, wide though it be, is, of course, confined to those places where a suitable supply of gas can be obtained, as from the mains of a town or village, unless special plant is erected to supply gas to the particular engine or engines to be driven. This is frequently done, and there are now many engines running with producer gas, giving very satisfactory and economical results.

The accompanying illustrations show an engine which is known as the "Moteur Gazogène Bénier," and which is being introduced into England by Mr. W. C. Horne, 5 Torrens Road, City Road, London, E.C. The engine is shown by Figs. 5, 6 and 7, while Figs. 1, 2, 3 and 4 are views of the generator which supplies gas to the engine.

The principle of the apparatus is as follows: The engine is of the "two time" type, giving one propulsion for each revolution of the crank. The gas is supplied to it slightly below atmospheric pressure, as it is drawn from the generator by means of a pump fixed on the side or the engine cylinder, and worked from a crank at the end of the flywheel shaft.

This pump has two plungers of different diameters, which work in a cylinder to correspond. The large plunger draws in air and the small one gas, the proportion of air and gas being regulated by a slide valve which is worked from an eccentric fixed on the crankshaft. The return stroke of the pump drives the air and gas along separate pipes to a mixing chamber at the end of the engine cylinder. From this chamber they are admitted through a suitable valve into the engine cylinder, just after the products of combustion of the previous charge have been expelled. The return stroke of the piston compresses them, and when the crank has just passed the dead point they are exploded by electricity. Before the piston has reached the end of its stroke the exhaust ports are opened at a point behind the advancing piston, when it is nearly at the end of the outward stroke. The products of combustion are then free to flow into the atmosphere, which they do with the aid of pure air which is admitted behind them from the chamber at the end of the cylinder. This air is forced into the cylinder in front of the next charge of air and gas, by means of the slide valve before described. This slide allows the pump to pass a certain amount of air into the distributing box at the end of the cylinder, just in front of the air and gas which are to form the explosive charge. As the piston of the engine has some little distance to travel after the exhaust ports are open before it reaches the full extent of the out-stroke, and returns again to close the ports, the pump is during this time forcing the explosive mixture into the cylinder with the cushion of pure air before described in front of it. By the time the exhaust ports are closed, the cushion of pure air in front of the charge has forced out all the products of combustion, and the cylinder is full of the explosive mixture of air and gas ready to be compressed by the return stroke of the engine piston. This, it will be seen, forms one complete "cycle," and the operations we have just described are ready to be repeated. There is an explosion for every revolution of the engine, so that in order that the power may suit the load, the explosions are made to vary in strength by means of a governor, which regulates the quantity of gas admitted to the pump. The proportion of air to gas when the engine is working at full load is 6 to 4, while it is about 6 to 3½ when running light. The quantity of gas can also be varied by a small valve presently to be described. The gas is formed by drawing a mixture of air and steam through incandescent fuel. Anthracite is recommended by the makers, though any hard coal will answer, and coke also gives good results.

Having briefly outlined the principle upon which the engine and generator act, we will now describe the illustrations more in detail, and will commence with the generator. This, it will be seen, on reference to Fig. 1, is composed of a cast iron cylinder $A$, in which is a second cylinder $B$. These two cylinders contain the refractory material $A^1$, $B^1$. In the interior of $B^1$ the fuel is placed, it resting upon the top of the projections which are a part of a rotary grate $G$, containing water which is evaporated by the heat above. Between the material $A^1$ and the cast iron cylinder $B$ is an annular space $C$, which is closed at the top by the joint $D^1$, and is open at the bottom into the chamber $E$. The cylinder $A$ is fixed to a stand $F$, which supports the rotary grate $G$ before mentioned. At one side of this stand is a door, through which the ashes can be removed or the fire stirred.

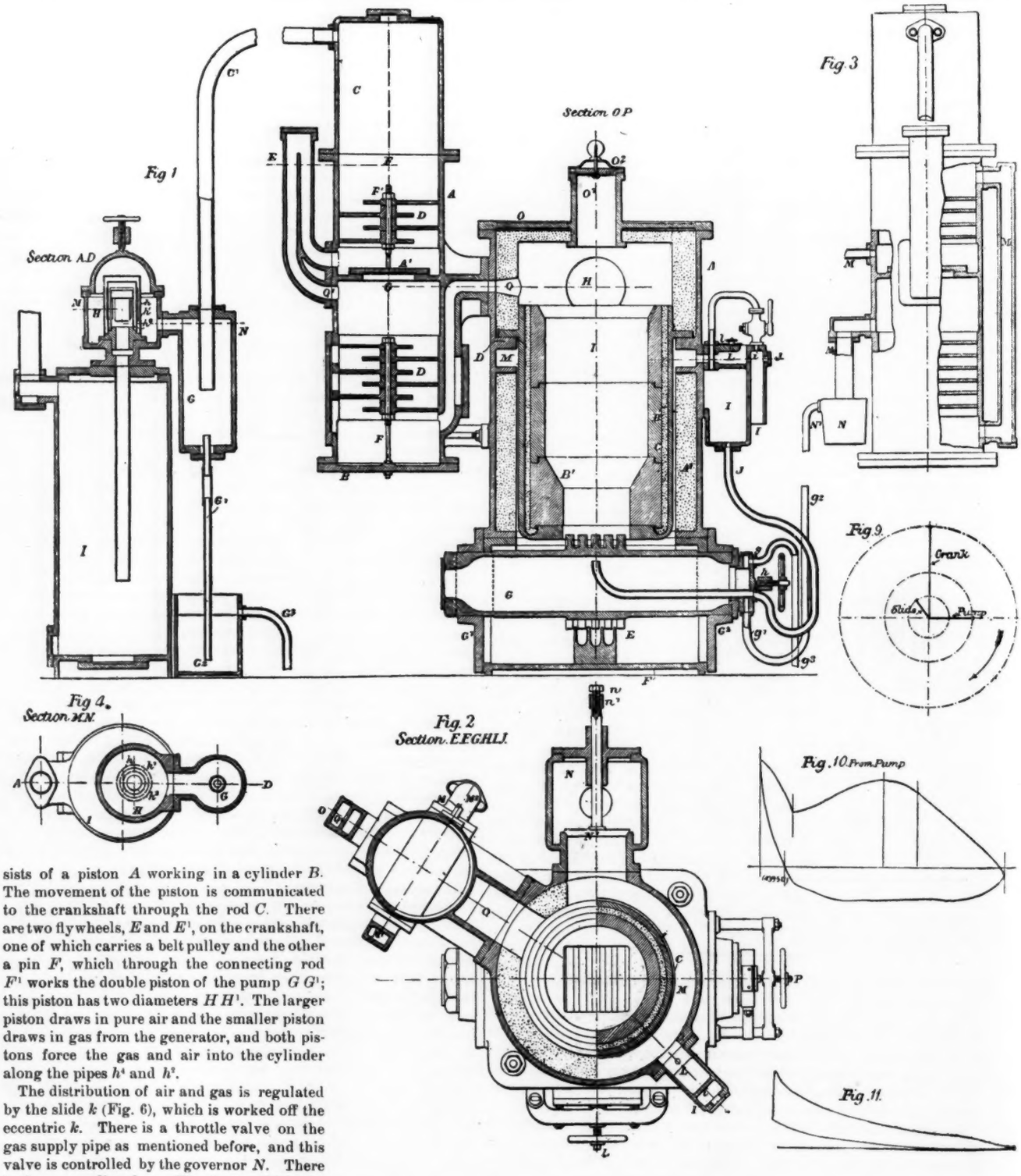
The chamber $G$ is partially filled with water, which is evaporated by the heat of the fire above, the steam passing along the tube $J$ into the bottom of the chamber $I^1$, up the tube above and through the small hole $i$ into the space $L$. There it mingles with the air which enters through the opening above, the size of which is regulated by the slide $l$; the steam and air are then drawn by the action of the pump down through the space $C$ and up through the incandescent fuel through $Q$ into the washer. This washer is cylindrical in shape, and is divided into two compartments $F$ and $F^1$. This cylinder is closed at its base by the plate $B$, and at its upper end by the dome $C$. In passing upwards the gas travels through the water contained in $F$, through $Q^1$, and up through water contained in $C$. The washing is more perfectly performed by the aid of the zigzag plates $D$, and from the top of $C$ the gas passes down a pipe into a water purifier $G$, and then up through a dust box $H$, and into the chamber $I$, whence it is drawn to the engine.

The rotary grate $G$ is kept in the stand $F$ by means of two plates $G^1$ and $G^2$, which form bearings. One end of the grate is made with six faces, so that a spanner can be applied for turning. The other end of the grate is closed by a stopper $g$, which is fixed while the grate can turn. The two portions are kept against one another by a screw. Into the cast iron stopper $h$ three tubes are fixed, the first, $g^2$, is for getting water into the grate, the second one, $g^3$, is for withdrawing the non-vaporized water, and the third one, $J$, is, as before stated, for carrying the steam formed in the grate $G$ into the box $I$.

The opening $O^1$ in the cover $O$ of the cylinder $A$ is for the admission of fuel. When the engine is not at work, the valve $N^1$ shown in plan is opened, and the gases from the furnace pass into a chimney.

Referring now to the engine, Figs. 5 to 7, it will be seen that it con-

1. From *Engineering*, England.




sists of a piston $A$ working in a cylinder $B$. The movement of the piston is communicated to the crankshaft through the rod $C$. There are two flywheels, $E$ and $E^1$, on the crankshaft, one of which carries a belt pulley and the other a pin $F$, which through the connecting rod $F^1$ works the double piston of the pump $G\,G^1$; this piston has two diameters $H\,H^1$. The larger piston draws in pure air and the smaller piston draws in gas from the generator, and both pistons force the gas and air into the cylinder along the pipes $h^4$ and $h^2$.

The distribution of air and gas is regulated by the slide $k$ (Fig. 6), which is worked off the eccentric $k$. There is a throttle valve on the gas supply pipe as mentioned before, and this valve is controlled by the governor $N$. There is also a small valve $e$ (Fig. 8), by which the supply can be altered to some extent by hand. Fig. 8 is an enlarged view of the slide $k$ and the slide box $L$.

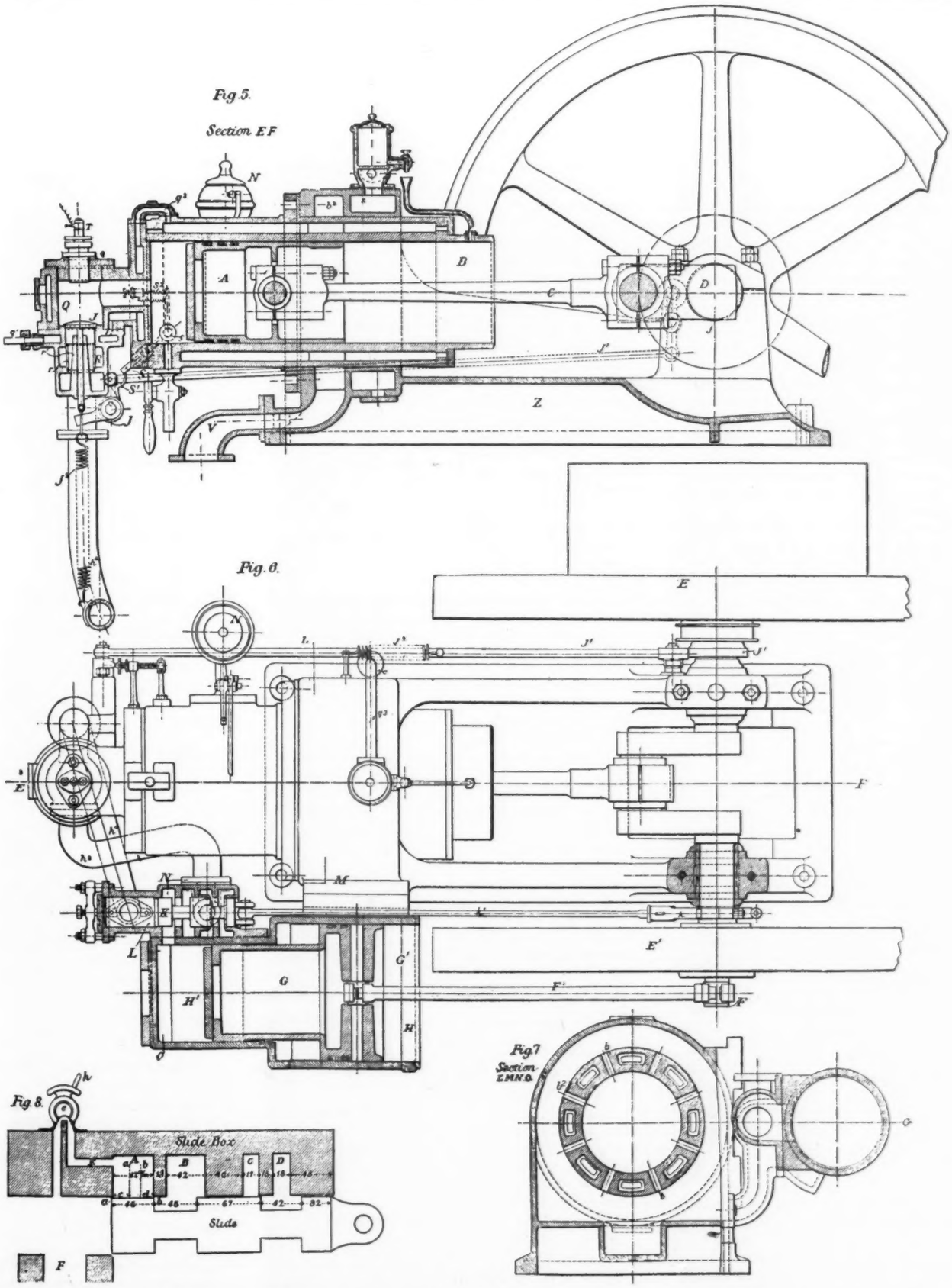
The air and gas enter the box $Q$ below the valve $J$, and are there thoroughly mixed by means of the copper ring $R$, which has orifices for the passage of the gas and pins $r^1$ to divide the air and facilitate the mixing. In the cover $q$ of the box $Q$ is the electric igniter $T$, the contact for the lighting being made through the two contacts $S$, $S^1$. The one $S^1$ being on the motion governing the valve $J$, a notch made in the cam $J^1$ produces the contact at the desired moment.

The pin $S$ oscillates around the axis $s$ through the spring $s^3$. According as the screw $s^2$ is turned backwards or forwards, the contact is made more or less rapidly.

In the cylinder $B$, Figs. 5 and 7, orifices $b$ are placed, through which the burnt gases escape when the piston uncovers them at the outward end of the stroke. From there they expand in a chamber $b^2$ in the frame $Z$, and on through the tube $V$.

The cylinder $B$, the box $Q$, and part of the frame $Z$, are so fitted that they can be cooled by a water current passing round them. The water enters through the pipe $q^1$, passes first round the valve box $Q$, and from there travels on through a bend $q^2$ and circulates round the cylinder $B$ into the chamber $z$, whence it escapes through the tube $q^3$, Fig. 6, and from thence into the drain.

Fig. 9 is a diagram showing the relative position of the engine and pump cranks and the eccentric which drives the slide. Fig. 10 is an in-




dicator diagram taken off the pump, and Fig. 11 one taken off the engine cylinder.

We understand that these engines are now being made up to 225 brake horse power, and one of them of 100 brake horse power is to drive a portion of the machinery in the Paris Exhibition of 1900. The makers guarantee a consumption of anthracite coal of not more than 25 ounces per brake horse power per hour.

We have had the opportunity of seeing one of these engines at work for some time, and have noticed that both it and the generator perform their duties in a very satisfactory manner.

[Concluded from page 490.]

## The Chemical Composition and Technical Analysis of Water Gas.[1]

[By Mr. Edward H. Earnshaw, Chemist to the United Gas Improvement Company.]

I have now indicated a method by which we may obtain a very fair idea of the composition of a gas mixture, sufficient, indeed, for most purposes. But the use of gas as a source of heat is constantly increasing, and I believe the time is not far distant when the heating value of a gas will be considered as important as its illuminating power. It is therefore extremely desirable to be able to accurately calculate the heating value of a gas from its analysis. The labors of many able investigators, and notably those of Prof. Julius Thomsen, have supplied us with reliable data concerning the heating value of each of the several combustible gases entering into the composition of illuminating gas, and therefore the problem would offer no special difficulty were it not for the uncertainty regarding the nature of the hydrocarbons removed by bromine, and classed together as "fixed illuminants." We know that these consist chiefly of the series $C_n H_{2n}$, together with very small quantities of the $C_n H_{2n-2}$ series, but the quantitative separation of the different members is not at present possible within the limits of a technical analysis.

If, however, we should succeed in determining the average composition of the hydrocarbons, and should be able to assign a definite heating value, depending upon such average composition, then the problem would be completely solved as far as its practical application is concerned.

The theory of the combustion of any hydrocarbon or mixture of hydrocarbons, of which the unit volume has the average composition $C_n H_m$, is as follows:

$$C_n H_m\left(n + \frac{m}{4}\right)O_2 = n(CO_2) + \frac{m}{2}(H_2O)$$

But in practice the

$$\frac{m}{2}$$

volumes of water disappear, and therefore we have—

Contraction in volume

$$= 1 + \left(n + \frac{m}{4}\right) - n = 1 + \frac{m}{4}$$

$$CO_2 \text{ formed} = n$$

If we let a = contraction in volume for x volumes $C_n H_m$,
b = $CO_2$ formed for x volumes $C_n H_m$, then we find—

$$(20) \quad m = \frac{4(a - x)}{x}$$

$$(21) \quad n = \frac{b}{x}$$

It is now apparent that if we can by any means determine the contraction in volume and the amount of $CO_2$ that would be formed by the combustion of a known volume of the illuminants in a gas mixture, then we will have all the data necessary for the correct computation of the average composition of such illuminants. This can be done very simply and accurately, thus:

First absorb the unfixed vapors by alcohol, and the $CO_2$ by potassium hydrate. The residual gas will have the composition—

$$C_n H_m + CO + H_2 + C_n H_{2n+2} + O_2 + N_2$$

Take a portion of this, mix it with the proper amount of air, and explode the mixture by a spark in the ordinary way. Note the resulting contraction in volume, and the amount of the $CO_2$ formed.

The contraction in volume will consist of—

(1) Contraction due to $C_n H_m$,
(2) " " CO,
(3) " " $H_2$,
(4) " " $C_n H_{2n+2}$,

and the $CO_2$ formed will consist in like manner—

(1) $CO_2$ due to $C_n H_m$,
(2) $CO_2$ due to CO,
(3) " " $C_n H_{2n+2}$.

If, now, we proceed with the analysis and determine the percentage of each constituent by the method already described, we will be able to calculate the contraction due to CO, $H_2$, and $C_n H_{2n+2}$, and the $CO_2$ due to CO and $C_n H_{2n+2}$. This will give us the contraction in volume and the $CO_2$ due to $C_n H_m$ alone, and hence the data required.

1. Read at a stated meeting of the Chemical Section of the Franklin Institute.

In practice it is simpler to calculate the correction for the paraffines and hydrogen directly from the results of the explosion rather than from the percentages of these gases, but this will be made plainer by considering the actual figures of an analysis.

Taking for illustration the same sample of water gas as before, the notes of the analysis would be:

| | Cubic Centimeters. | Per Ct. |
|---|---|---|
| Amount taken for analysis | 100.00 | |
| Residue after absorbing the unfixed vapors and the $CO_2$ | 96.90 (a) | |
| *First Explosion.* | | |
| Portion of (a) taken | 12.00 | |
| Mixed with 87.8 cubic centimeters of air and exploded: | | |
| Resulting contraction in volume | 16.05 | |
| $CO_2$ absorbed by potash | 10.55 | |
| Excess oxygen absorbed by phosphorus | 3.40 | |
| Residue from (a) | 84.90 | |
| Fixed ills. absorbed by bromine | 10.25 = | 11.70 |
| Oxygen absorbed by phosphorus | 0.44 = | 0.50 |
| CO absorbed by cuprous chloride | 27.78 = | 31.70 |
| Residue (b) | 46.45 = | 53.00 |
| *Second Explosion.* | | |
| Portion of (b) taken | 14.05 | |
| Mixed with 87.8 cubic centimeters of air and exploded: | | |
| Resulting contraction in volume | 22.60 | |
| $CO_2$ absorbed by potash | 5.30 | |
| Excess $O_2$ absorbed by phosphorus | 3.80 | |

The amount taken for the first explosion was

$$\frac{12}{96.9} = .1237$$

of the original quantity, and we can, therefore, calculate that it was composed of—

| | Per Cent. | Cubic Centimeters. |
|---|---|---|
| Fixed illuminants | 11.70 × .1237 | 1.45 |
| Oxygen | 0.50 × " | 0.06 |
| Carbonic oxide | 31.70 × " | 3.93 |
| Residue (b) | 53.00 × " | 6.56 |
| | | 12.00 |

The contraction and $CO_2$ resulting from the explosion of 14.05 cubic centimeters of residue (b) having been determined by the second explosion, we can, of course, readily calculate the results due to the combustion of 5.56 cubic centimeters.

The results of the first explosion can now be tabulated thus:

| | | | CO₂ Contraction. Cubic Centimeters. | |
|---|---|---|---|---|
| 1.45 | cubic centimeters fixed ills. ($C_n H_m$) | gives | 4.15 | 3.56 |
| 3.93 | " " carbonic oxide | " | 3.93 | 1.96 |
| 6.56 | " " residue (b) | " | 2.47 | 10.53 |
| | | | 10.55 | 16.05 |

and hence from equations (20) and (21),

$$m = \frac{4\ (3.56 - 1.45)}{1.45} = 5.82$$

$$n = \frac{4.15}{1.45} = 2\ 86$$

and, therefore, the average composition of the fixed illuminants $C_n H_m$ is C 2.86 H 5.82.

Prof. Julius Thomsen in his "Thermo Chemical Investigations," Vol. IV., p. 275, gives the general formula for the calculation of the heat of combustion of any hydrocarbon of the formula $C_n H_{2m}$, expressed in calories per molecular weight in grams of the hydrocarbon, thus:

$$f = n.135340 + m.37780 - a.14200 + 580.$$

For the olefine series, $C_n H_{2n}$,

$$n = m$$
$$a = n - 1$$

and, therefore, translating the formula into English units, we find for the heat of combustion of any hydrocarbon, or mixture of hydrocarbons of the general formula $C_n H_{2n}$.

$$\text{B.T.U. per cubic foot} = n\ (757) + 70.$$

$$\text{B.T.U. per pound} = 20432 + \frac{1900}{n}$$

For the paraffine series, $C_n H_{2n+2}$,

$$m = n + 1$$
$$a = n - 1$$

and, therefore, we find for the heat of combustion:

$$\text{B.T.U. per cubic foot} = N\,(757) + 251$$

$$\text{B.T.U. per pound } 20432 + \frac{53{,}744}{14n + 2}$$

We found the composition of the illuminants to be $C_{2.86} H_{5.82}$, and this approaches so closely to the composition of olefines, that for all practical purposes we may consider the fixed illuminants as belonging entirely to that series.

Therefore, calculating the average heating value of the illuminants from the formula for the olefins, we have:

$$\text{Illuminants, } C_{2.86} H_{5.72} = 2{,}235 \text{ B.T.U. per cubic foot.}$$

We found the average composition of the paraffines to be $C_{1.32}H_{4.64}$, and hence from the formula for the paraffines, the average heating value would be:

$$\text{Paraffines, } C_{1.32}H_{4.64} = 1{,}250 \text{ B.T.U. per cubic foot.}$$

We have shown that the determination of the total amount of paraffines in a gas mixture is not affected by considering $CH_4$ and $C_2H_6$ to be the only two members of the series present, and it is also true that the calculation of the heating value is unaltered by the same assumption. This may be shown as follows:

The percentage of paraffines present, and their composition, was found by the analysis to be

$$14.55 \text{ p. c. } C_{1.32}H_{4.64} = 4.71 \text{ p. c. } C_2H_6 + 9.84 \text{ p. c. } CH_4.$$

The calculation of the heating value would be

.1455 cubic foot $C_{1.32}H_{4.64} \times 1{,}250 = 182.9$ B.T.U.
.0471 " " $C_2H_6 \times 1{,}764\,4 = 83.1$ } 182.3 B.T.U.
.0984 " " $CH_4 \times 1{,}009 = 99.2$ }

Thus the result is the same whichever method of calculation is adopted.

The heating values obtained by Prof. Julius Thomsen for the principal constituents of illuminating gas are given in the following table. Thomsen's original figures are given in calories per molecular weight of the substance in grams, and I have translated these into English units per cubic foot. The temperature of the products of combustion is assumed to be reduced to 18° C., or 64.4° F.:

| Name. | Molecular Formula. | Calories per Molecular Weight in Grams. | B.T.U.'s per Cubic Foot at 60° and 30". |
|---|---|---|---|
| Hydrogen | $H_2$ | 68,360 | 326.2 |
| Carbonic oxide | CO | 67,960 | 323.5 |
| Methane | $CH_4$ | 211,930 | 1,009.0 |
| Ethane | $C_2H_6$ | 370,440 | 1,764 4 |
| Propane | $C_3H_8$ | 529,210 | 2,521.0 |
| Butane | $C_4H_{10}$ | 687,190 | 3,274.0 |
| Ethylene | $C_2H_4$ | 333,350 | 1,588.0 |
| Propylene | $C_3H_6$ | 492,740 | 2,347.2 |
| Butylene | $C_4H_8$ | 650,620 | 3,099.2 |
| Acetylene | $C_2H_2$ | 310,050 | 1,476.7 |
| Benzene | $C_6H_6$ | 799,350 | 3,807.4 |

Returning once more to our analysis, the calculation of the heating value of 1 cubic foot of the water gas would be:

| | | | | |
|---|---|---|---|---|
| .0040 | cubic foot | $C_6H_6 \times 3{,}807.4$ | = | 15.2 B.T.U. |
| .0170 | " " | $C_{2.86}H_{5.72} \times 2{,}235$ | = | 261.5 " |
| .3240 | " " | $CO \times 323.5$ | = | 104.8 " |
| .3557 | " " | $H_2 \times 326.2$ | = | 116.0 " |
| .0471 | " " | $C_2H_6 \times 1{,}764.4$ | = | 83.1 " |
| .0984 | " " | $CH_4 \times 1{,}009.0$ | = | 99.2 " |
| .0538 | " " | $CO_2 + O_2 + N_2$ | = | 0.0 " |
| 1.0000 | | | | 679.8 " |

## Coke Making for Profit.

By Mr. Fred C. Keighley, in *Am. Mfr.*

Mr. John Fulton, in his book entitled "Coke," states that on January 1, 1896, there were 45,000 coke ovens in the United States, and that less than 200 of that number were of the by-product type, leaving over 44,800 beehive coke ovens in the possession of the coke industry. From the statistics for 1897, I learn that on January 1, 1898, there were 47,668 coke ovens in the United States; of these, 310 were of the by-product type, 33 of which were not operated during 1897, leaving only 277 by-product ovens in operation, and that includes a few Thomas ovens in Alabama, and 36 gas retort ovens in Colorado; so that the beehive coke oven industry, instead of losing ground, actually gained over 2,500 ovens in number and left it in the field with a grand total of 47,391 beehive ovens, that will, in all probability, continue in the business for many years to come, and they will doubtless increase in number for many more years; for the beehive coke oven is by no means the despicable institution its traducers try to make it appear to be. That the by-product oven is a wonderful invention I will not deny; but that it is going to annihilate the beehive oven I will dispute; and would further say that when the coke maker gets better acquainted with the beehive oven (the best friend he ever had) he will be surprised how little has been done to give it even fair play.

The apparent simplicity of the beehive oven has been the means of concealing its possibilities for better work, and even under the unfavorable circumstances which the beehive coke oven is subjected to, the young man who is contemplating the selection of coke making as his life's vocation, cannot do better than begin his apprenticeship with it, even if nothing less than the achievements of the beautiful visions of the by-product man will satiate his thirst for gold and glory. I think that the above facts are fully sufficient to justify me in taking up the pen and placing before the public the series of articles entitled "Coke Making for Profit."

There is a law of proportion to all things that no one, not even the coal operator or coke manufacturer, can afford to ignore, yet it is frequently done; and it is not hard, even at the present day, to find an overgrown coke works wedded to a poor, insignificant coal mine, and and a most unsatisfactory couple they are. Again, a good mine and a good plant of ovens may be found that is marred with a poor or inefficient equipment. Sometimes there has been a misconception of the relation of one to the other, with the result that there is a continual hitch in the operation. First, the mining operations are blocked; and then, perhaps, when once more they are in full swing, the ovens are blocked, etc., etc.

In some cases this has been the sole cause of failure to get satisfactory results; in other cases, a comparatively small coke plant has been installed on a large tract of coal land, and the whole has consequently been literally eaten up with the fixed charges entailed upon it. On the other hand, a coke plant much too large for the coal acreage tributary to it has been installed, and from first to last it has been an impotent struggle to keep the operation going on either a regular or a profitable basis. So persons contemplating going into the coke business will find it greatly to their interest to consider the above remarks and the following facts.

A plant of more than 300 coke ovens becomes unwieldy; and when the ovens are less in number than 300, the fixed charges are apt to be high. A man can manage two 300 oven plants, if not too far apart, with more ease than one 600 oven plant; and it would take as many officials to operate a 600 oven plant as it would to operate two 300 oven plants. So, if a large number of ovens be desired, the best plan would be to divide them, as nearly as practicable, into 300 oven plants. This is not only my view of the matter, but the view of the more experienced coke men of the Connellsville coke region. So, in what I write hereafter, I shall make my observations and suggestions mainly with reference to a plant of that magnitude. However, there are many people that would not or could not build a plant of 300 ovens, and they would naturally ask how they are to determine how many ovens to build. This is a somewhat difficult matter to decide, as there are many things to consider; yet there are certain conditions that in a degree indicate what is to be done. For instance, if the manufacture of coke for the blast furnace trade is contemplated, then the extent of that kind of trade to be had would fix the number of ovens to be built.

Modern blast furnaces consume all the way from 300 to 600 tons of coke per day, and as many furnace men object to the use of mixed coke, owing to its interfering with regular or uniform work, to build less than sufficient ovens to run one furnace would certainly be fatal to the success of the venture. Generally speaking, 12-foot beehive coke ovens will yield 2 tons of coke per oven per day; so a blast furnace of 300 tons of coke per day capacity would require 2,100 tons of coke per week of 7 days. A coke oven week is but 6 days; therefore, the quantity required from the ovens would be 350 tons per day; this divided by two would give us 175 coke ovens—the number required. A two 300 ton furnace capacity plant would require 350 ovens, and so on. If foundry trade were to be supplied (instead of furnace trade) the number of ovens required would be determined in an altogether different manner; and I know of no better or safer way of determining it than by the coal acreage owned or controlled by the prospective coke operator.

An 8-foot seam of Connellsville coal will yield fully 12,000 tons of coal per acre, if free from faults and skilfully mined, and this in turn, if properly manipulated, will yield 8,000 tons of coke. Taking 600 tons as the work of a 12-foot beehive oven for one year, an acre of coal would keep one coke oven running steadily for 13⅓ years—allowing for dull trade, strikes, car shortages and repairs, we might safely put in 15 years.

If the coal to be operated were drift coal and comparatively cheap to develop and equip, 15 years would be a safe life for the plant; but should the coal be below water level, necessitating the installment of costly machinery and pumps, and the sinking expenses be heavy, then 30 years would be none too great a period to allow to get out all there was in the equipment. For instance, a property of 150 acres of drift coal would require 150 coke ovens to make what I term a fairly well-proportioned plant; but a slope or shaft coal property of over 100 feet and up to 200 feet in perpendicular depth, to get the best attainable results, should be of such acreage as to sustain at least 200 coke ovens for 30 years. A 200 oven plant on such a basis would require at least 400 acres of coal. Deeper coal would require more coke ovens and a correspondingly greater acreage to make it a well-balanced venture. Take the following figures as factors:

One coke oven yields 600 tons coke per year.

One acre of 8 foot Connellsville coal yields 12,000 tons of coal, 12,000 tons of coal make 8,000 tons of coke.

One acre of 8-foot coal will run one oven 15 years.

Life of a drift plant, 15 years.

Life of a 100 foot sinking, 30 years.

One acre of coal for each oven at a drift plant.

Two acres of coal for each oven at a 100 to 200-foot depth.

Twice as many coke ovens on a 200 to 400-foot depth as on a 100 to 200-foot depth, and a correspondingly increased acreage.

In very large tracts of coal land, a correspondingly large number of ovens in plants of 300 ovens to each establishment.

With this data as a basis for calculation, anyone of ordinary ability should be able to determine the number of ovens required on a given acreage, or the acreage required for a given number of ovens. Of course, the kind of trade expected must not be overlooked in making up the verdict.

Small coke plants are generally arranged on a single line of bank ovens, but the larger plants are made up of several rows of bank and block ovens, in order to secure compactness, etc. The arrangements of the ovens is generally governed by the location that is available. There are very few natural oven locations, and often, even when a good oven location is found, it cannot be used because it does not also afford a good coal mine site, or the grades are such that it cannot be reached by railroad with a profitable grade. It would be out of the question to lay down any rules as to the arrangement of the ovens; so what I have to say relative to the location of the ovens, etc., must be taken in a general way, and with due consideration.

Beehive bank ovens when located parallel with or to moderately rising ground where the rock does not crop out above the floor or seat of the contemplated oven, and the soil is of the proper character and solidity and can be well drained, make the best and cheapest of all beehive oven locations—best, because the ovens can be located on naturally solid ground, affording a firm foundation at small cost, and the ground rising behind them affords not only a storage battery for heat, but also allows the oven to expand backwards instead of forwards, and thus relieves the oven and retaining walls from excessive strains. Another advantage with such a location, would be that all the ovens would face the pure air if all in one string, which is quite an advantage, as coke ovens that face the air always make more, and, unless in stormy weather, brighter coke.

Bank ovens are the cheapest to build, for the reason that the side cut for the ovens also makes the filling for the coke yard or wharf, while the dirt for filling around the ovens can be easily and cheaply obtained from the rising ground behind; however, I would not advise that the whole of the 300 ovens be located on a single line, for the following reasons, viz.: First, because it would not be the most economical way of charging the ovens, owing to the long distance to be traveled over; and second, the long distance traveled over would necessitate an increase of speed for the charging equipment, which, in turn, would not only cause excessive vibration, which would shorten the life of the oven, but would also increase liability to accident, excessive strains to the larry tracks, and more wear and tear to the equipment; third, the wheel on the coke yard would be longer than desirable for the coke drawers; and fourth, the length of the larry tracks on the ovens, and the length of the sidings for the railroad cars, would be very much greater than desirable, convenient or economical, and would further necessitate many cuts or breaks in the ovens for ways, for ash carts, etc. In view of the above important factors, the plant, if all bank ovens, should consist of two rows of ovens of 150 each, the said rows facing each other, with the railroad siding running down between the respective coke yards.

Such a plant as the one just described cannot be built on many locations, as it would necessitate location in a narrow valley where there would likely be a stream of water to contend with, etc., etc. So it is more than likely that the plant would have to be built something after the following lines, namely: One hundred bank ovens and 200 block ovens, making three parallel rows of 100 ovens each; this would necessitate two railroad sidings and three coke yards. I have operated three 300 oven plants built on these lines and have found them to be very satisfactory. The 100 bank ovens would, of course, be built on solid ground, as explained before, so that ring walls would be hardly necessary, although if there were the slightest doubt respecting the solidity of the ground, 18-inch walls should be built from the solid ground up for the oven linings to rest upon. Piers 7 × 2 feet should be built between the ovens for the larry tracks to rest upon. If possible, cuts should be left midway in both the bank and the block ovens, in order to shorten the haul for ash carts.

I have operated coke ovens of diameters ranging from 11 feet to 12 feet 3 inches, and I think that the 12-foot oven (which is the standard in the Connellsville coke region) is the right diameter. In building coke ovens it is a very common thing to build the oven linings "skin to skin"; and in the block ovens they are often "nested," instead of being set directly opposite to each other. This I am positive, is a very bad practice, and I would advise that at least a foot of space be left between the linings of the ovens, and that space be filled with some infusible material, which should be packed firmly, but not rammed, as is the common practice. I am opposed to ramming or tamping very hard, for the reason that unless the tamping is done uniformly all around the oven at the same time, and with the same degree of force, the oven will be thrown out of round as soon as it is heated up; for the brick will meet with hard places in the tamping, and there will also be soft spots into which the brick will be forced, and as a natural consequence the oven will be weakened.

[To be Continued.]

## Concrete Aggregates.

Mr. Warner H. Jenkins, C.E., writing in *Municipal Engineering*, says: The use of concrete for every kind of construction has become so general that the quality of the materials, of which it is made is a matter of great importance. Specifications prepared for this purpose invariably call for broken stone to the exclusion of other materials. I find that many persons, who have not given the subject proper consideration, contend that the compound is complete whereby stone, regardless of its quality or texture, enters into the mass. I will here state that as much care should be taken in the selection of the aggregates, stone and sand, as in that of cement. The stone should be perfectly clean and free from flour and dust. The fragments should possess angular faces and be graduated as to size. The theory that limestones contribute to the strength of the mortar with which they are mixed and ultimately produce stronger concretes, is incorrect. The limestone will invariably produce a concrete that can be termed as tough, but never attains extreme hardness, which is essential in all constructive work. I have also found that concretes prepared from limestone aggregates are much more liable to expansion than other stones. The irregular faces and sharp edges of broken stone are not all the advantages in the composition of concrete. It is essential that the aggregates should vary in size, so as to form a wedge with each other, and thereby permit of being properly compacted by ramming. Care should be taken to exclude long, thin fragments, which invariably crush under pressure or break in ramming the mass. The best concrete is obtained by using at least two sizes of broken stone, smaller than the largest aggregate. This fact can be readily demonstrated by mixing the stone and placing it in a heap, when the resistance to ramming will be apparent. The use of one size stone is liable to produce arching, even when the presumption is that the concrete has been properly rammed. When preparing concrete I have frequently used screened gravel with equal parts of broken stone. I have found its oval surfaces pack more closely in the interstices of the stone. To sum up the matter, a variety of shapes and sizes in the aggregates is essential for the ultimate strength of concrete. I would therefore recommend that a percentage of the stone aggregates used in concrete be proportioned into at least two sizes, under the largest aggregate.

## The Gem Self-Lighter Applied to the Bray Burner.

A new field for the Bray burner has been opened up by the William M. Crane Company, of this city, in adjusting the Bray regulator or tip to work in conjunction with the Crane Company's Gem self-lighting burner. The accompanying illustration virtually carries its own explanation. The plan seems a decided improvement on the old-time self-lighters, with the ordinary lava tip, and the goods are in every way first class. The Gem Manufacturing Company recently sold out to the Crane Company, and the purchasers have improved the device so much that the Gem bye-passes and self-lighting burners are now in the front rank.

We understand that the Crane Company will send a sample self-lighting burner to any gas company applying for same.

## ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

Mr. L. N. Case, of Detroit, Mich., has been appointed to manage the gas and water plants at Duluth, Minn., which plants were recently acquired by purchase, for operation on municipal account, from the proprietors of the Duluth Gas and Water Company.

At the annual meeting of the Brookline (Mass.) Gas Company the following officers were elected: Directors, H. M. Whitney, C. D. Burrage, W. R. Addicks, R. W. Lord and F. Tudor; President, H. M. Whitney; Treasurer, E. G. Storey.

The proprietors of the Riter-Conley Company, of Pittsburg, Pa., inform us that the name of the Company has been changed to that of the Riter-Conley Manufacturing Company. The general offices of the Company remain as before in Nos. 55 and 56 Water street, Pittsburg. The Company's New York address is 39 and 41 Cortland street.

A correspondent, writing from Philadelphia, under date of Sept. 29th, says:

To the Editors American Gas Light Journal: Not much of humor crops into this prosaic gas business, but when it does, why should not the Journal let all the craft enjoy it? This incident occurred in a Southern town about a month ago. A prepayment meter had been set in a boarding house, but the fitter neglected to purge the house pipes. As it grew dark, the colored boy of all work was sent to drop a quarter into the meter. He returned and reported the quarter as deposited. The proprietress turned on a burner and applied a lighted match, with the result of no light. "Mose," said she, "there is no gas 'yer!" "Why, sho', Missis," said Mose. "Dat quarter ain't got up to de gas offis yit." And Mose still watched for the gas to arrive.

The following notice to its consumers and the public was issued by the Laclede Gas Light Company, of St. Louis, under date of Sept. 21st: To encourage a larger use of gas for manufacturing purposes, this Company offers the following schedule of reduced rates for gas used for fuel and power after October 1, 1898:

| | Per 1,000 Cu. Ft. Net. |
|---|---|
| For the first 25,000 cubic feet..... ..... | 80 cents. |
| For an additional 25,000 cubic feet, or any part thereof | 70 " |
| For all over 50,000 cubic feet..... | 60 " |

The above rates are based upon quantities of gas used monthly, for fuel or power, through one meter, and do not apply to gas used for illuminating. Bills will be rendered at gross rates, or 10 cents per 1,000 cubic feet higher than the above schedule, and the discount allowed on all bills paid on or before the 10th of each month. By the adoption of these prices it is hoped that gas will be brought into use for many new purposes by the various manufacturing industries, where its advantages over other kinds of fuel are well understood, and that the gas engine, always a popular and economical source of power, will now be in still greater demand.

Deputy Commissioner Walton, of Public Buildings, Lighting and Supplies for the Borough of Brooklyn, N.Y., has established a proving room for gas meters complained of by consumers, in the premises corner of Park and Clinton avenues, Brooklyn.

The proprietors of the Edison Electric Illuminating Company, of New York, have issued the following circular announcing a revision of the selling rates. The circular in part reads: "The Edison Company, in accordance with its declared policy of reducing rates and encouraging the more general consumption of the electrical current, particularly for long-hour use, will replace its present schedules, for both incandescent and arc lighting, by the reduced rates scheduled below on bills due after October 15, 1898. *For Retail Use.*—Twenty cents per kilowatt hour, equivalent to 1 cent per 16 candle power, 50-watt incandescent lamp hour, or 10 cents per standard arc lamp for first hour's daily use; 15 cents for second hour; 10 cents for third and fourth hours; 5 cents for all use above four hours. *For Wholesale Use.*—Ten cents per kilowatt hour for the first four hours, and 5 cents for all use above four hours, with reduction for quantity."

Messrs. R. D. Wood & Co., of Philadelphia, are under contract to deliver to the Water Committee, of the Glasgow (Scotland) Corporation, several hundred tons of cast iron pipe, of 7 to 12 inches diameter.

In the annual report of the Inspector of Mines (Mr. G. W. Stone), State of Kentucky, respecting the operations of that department for 1897, the enactment of laws controlling the character of the illuminating oils used in the mines of the State is forcefully urged.

The proprietors of the Williamsport (Pa.) Gas Company have decided not to extend the main system to the outlying district of Montoursville.

Advices from Wilkes-Barre, Pa., are to the effect that a mutual understanding between the owners of the Wilkes Barre Gas Company and of the Wilkes Barre Electric Light Company has been reached. Under the agreement a syndicate holds an option very much in excess of control in the electric light company, which option is to be exercised by the 20th inst. The syndicate in turn is controlled by the proprietors of the Gas Company. This movement does not mean that the two Companies are to be consolidated, for such action would be in contravention of the laws of the State; but it does mean that senseless if not ruinous competition is to be terminated.

The Directors of the Woonsocket (R. I.) Gas Company have perfected the following executive organization: President, Joseph B. Aldrich; Treasurer, Reuben G. Randall; Clerk, Z. M. Jenks; Executive Committee, J. B. Aldrich, George M. Welles and A. H. Rankin.

The Norfolk (Va.) *Landmark*, of September 30th, says: "The Peoples Light, Power and Fuel Company, of Norfolk, which was granted a charter by the last Legislature, applied some time since to the Norfolk City Councils for the right to use the streets of the city to lay pipes, etc. The matter was referred to a special committee, and on the afternoon of September 29th a meeting of the committee was held. There were present at the meeting Messrs. Hannan (Chairman), Cousins and Seneca, of the Common Council, and Messrs. Consolvo and Jacobs, of the Select Council; also, Mr. A. C. Humphreys, President of the City Gas Company; Mr. A. G. Glasgow, a stockholder of the same Company; Mr. H. L. Rice, Superintendent of the City Gas Company; Mr. P. Wright and Mr. J. L. Belote, President and Superintendent, respectively of the Virginia Electric Company, and others. Mr. T. H. Willcox appeared as Counsel for the applicant Company, and Mr. A. P. Thom and Mr. William H. White appeared as Counsel for the City Gas Company. The committee listened to arguments by Messrs. Willcox and Thom, pro and con, and adjourned until Thursday, October 13, at 8 P.M. Mr. Willcox, in asking for the ordinance desired, said that if the committee thought it would be better for the city to have only one gas company within its bounds, it would be its duty to make an unfavorable report on the ordinance asked for; but on the other hand, if the members thought that competition would give cheaper gas rates, and to have another company would benefit the city, he thought it their duty to report in favor of the applicant Company. He contradicted the rumor that it was only the purpose of the Peoples Light, Power and Fuel Company to place its pipes in certain sections of the city, and said that the Company would, if allowed, run its pipes in all directions. He read the proposed ordinance providing, among other things, that work must be commenced in 6 months, and finished within 18 months, and that the Company must give bond in the sum of $10,000 to protect the city and others from possible damage to sewer, water, telephone, gas and other pipes. He said that the new Company's charter was not obtained for the purpose of holding it as a menace over the City Gas Company, but that the gentlemen he represented wanted to go ahead with the work and are asking nothing to the exclusion of others. Mr.

A. P. Thom, for the City Gas Company, next addressed the committee. He said that competition might not be so beneficial as one on the impulse of the moment was apt to think. He contended that the process which the new Company proposed to employ had been discredited and exploded in Washington, and that it is only used in three places in the United States, the combined population of which is not up to that of Norfolk. He thought the city should be certain that the new Company is going to use a reliable process before allowing it to come into the city and injure a Company that has 25 miles of piping, owns $500,000 worth of property and is paying the city $5,000 per year in taxes. Mr. Thom contended it should be shown that the new Company had a subscribed capital and would be able to carry out its plans as proposed. He argued that a suitable bond should be required for the faithful execution of the project. This concluded the argument."

THE authorities of Louisville, Ky., have named Mr. J. P. Claybrooke as the representative of the city on the board of arbitrators (three in number) charged with fixing the price at which gas may be sold by the Louisville Gas Company for the next period of five years.

MR. I. C. BAXTER has returned from a three months' trip abroad. His legion of friends will hear with hearty satisfaction that the object of his journey (the benefiting of his health) was completely attained.

WE are informed that the Canisteo Gas Company, of Canisteo, Steuben county, N.Y., has been incorporated, with a capital of $25,000. The incorporators are Messrs. W. T. Morris, of Penn Yan, J. B. Bradley, of Bolivar, and E. C. Bradley, of Wellsville.

DURING the summer the Elyria (Ohio) Gas and Water Company placed 140 gas services and about a like number of gas ranges.

AT a meeting of the Middletown (N. Y.) Common Council, held the last week in September, the following resolution was adopted: "That the Corporation Counsel notify the Middletown Gas and Electric Light Company to reduce its rates to the rates in surrounding places in 10 days, and on its failure to do so the said Counsel is instructed to bring suit on its franchise." Prior to this action a special committee of the Council had interviewed Mr. L. C. Purdy, President of the Company, with a view to learning what concessions the Company would make in the matter of gas supply. He said the Company would agree to abolish meter rentals and that the minimum monthly 50 cent bill would also not be insisted on, but declined positively to order a concession of 25 per cent. in the ruling rate schedule.

A CORRESPONDENT forwards the following: "The Cambridge (Mass.) Gas Light Company has taken the large store 1288 Massachusetts avenue, and has fitted it up in handsome style. The old offices of the Company have undergone a complete making over. The premises at 1288 Massachusetts avenue will be mainly devoted to exhibiting gas appliances, etc., the executive offices being retained in 1290 Massachusetts avenue."

AT the annual meeting of the Amherst (Mass.) Gas Company the officers elected were: Directors, E. F. Cook, Henry Adams, Fred. Tuckerman, C. Fred. Deuel, E. D. Marsh, C. H. Fernald and M. A. Dickinson; President, E. D. Marsh; Clerk and Treasurer, C. F. Deuel.

WE understand that Mr. A. W. Roche is to return to the service of the Pasadena (Cal.) Consolidated Gas Company.

MR. L. J. CARDER, the efficient and enterprising Secretary and Manager of the Citizens Gas Company, of Jacksonville, Fla., has completed the fitting up of a handsome showroom for gas appliances in the Company's headquarters, No. 29 West Forsyth street.

THE Trustees of the Toledo, Ohio, municipal gas (natural) plant have announced that on and after November 1st the gross rate per 1,000 cubic feet shall be 30 cents; prompt payment entitles the user to a rebate of 10 per cent. The current rates are: Gross, 25 cents; net, 20 cents.

MESSRS. HAAS AND LOUDON, who proposed to operate an opposition gas plant at Birmingham, Ala., have abandoned the project.

THE Fort Wayne (Ind.) *Gazette*, of recent date, announces the incorporation of the American Gas Engine Company, with a capital of $50,000, divided into 10,000 shares of the par value of $5 each. The Directors are Messrs. O. N. Guldlin and E. F. Lloyd, of Fort Wayne, Ind.; Wm. W. Goodwin, of Bordentown, N. J.; Wm. Henry White, of New York, and E. W. Mumford, of Philadelphia. The *Gazette* also states that the chief stockholder in the Company is Mr. W. W. Gibbs, of Philadelphia.

THE Detroit City Gas Company is comfortably installed in its new offices, in the Ferguson Building, 230–234 Woodward avenue.

MR. JAMES E. STACEY, President of the Florence (Ala.) Gas Company, has arranged for notable additions to that plant. The main system is to be largely extended.

THE authorities of Wapakoneta, Ohio, have assented to an extension of the franchise of the Wapakoneta Artificial Gas Company for a period of 20 years. We understand that the plant will be rebuilt.

THE gas rate at Maysville, Cal., has been reduced to $2 per 1,000 cubic feet.

SUPT. L. E. WALKER, of the Lansing (Mich.) Gas Light Company, is not as busy as he was, for the completion of the line of pipe on the Michigan avenue bridge practically terminates the extensions this season to the Company's distributing system. About four miles of mains were put down.

TALLAHASSEE, Fla., wants its street lamps maintained on an all night and every night basis. A moontable is now in vogue; and it is a very elastic one at that.

CERTAIN speculators have applied to the City Council of Denver, Col., for a franchise permitting the operation in that city of an opposition gas concern, the title of which is given as the Mutual Gas Company. In the instance of the prices that may be charged the franchise states that the rate for an illuminating supply may not exceed 85 cents per 1,000 cubic feet, the charge for a fuel supply to be 60 cents; but consumers who do not pay their bills within 15 days may be charged 15 cents additional per 1,000. The city is to receive in consideration of the grant of the franchise 3 per cent. of the annual gross receipts until the Company's output amounts to 500,000 cubic feet per annum, when the city's emolument shall be increased to 5 per cent. of the gross receipts. Another provision declares that "After five years, dating from the passage of the ordinance, the city shall have the right to buy the entire plant of the Company, at an appraised value which shall be ascertained by three competent and disinterested appraisers." The method of appointing appraisers is then outlined, and other "methods, conditions and prescriptions" are detailed at length. The plaint and its purposes were referred to the Council Committee on Gas and Electric Light.

## The Market for Gas Securities.

A condition not far from panic existed in the market for city gas shares early in the week. On free offerings Consolidated sold down to 164, recovered to 176, and again sagged off to 170. The opening price to day (Friday) was 169½ bid, offered at 170½. The decline also extended to all other city gas shares, the greatest sufferer, perhaps, being Mutual, which is reported at 300 to 312. Standard common is offered at 131, and Amsterdam common is fairly steady, no doubt on inside support, at 26½ to 27½. There is no gainsaying the fact that the artificial illuminating situation in New York is sadly mixed, and that a right royal battle is on. This remark applies also to the electric lighting situation, which trading is involved in a rate war. Another disturbing factor was the formation of the New York Gas and Electric Light, Heat and Power Company, to operate in New York city, with a capital of $25,000,000. At this writing the concern is presumed to have closer relation with the electric than the gas business. Even though the fight is on, our own belief is that gas shares are worth very much more than the prices at which they are selling.

Brooklyn Union holds its own fairly well, as does Consolidated, of Baltimore. Peoples, of Chicago, is another strong feature. The Directors of the Wilmington (Del.) Coal Gas Company have notified the shareholders that the capital stock is to be increased by $50,000 (from $550,000 to $600,000), and that the issue is to be sold at par to holders of record of October 4th. Failure to accept the conditions imposed on or before November 15th will entail forfeiture of rights in the premises. The agreement in full will be published next week in the JOURNAL. Lacledes are firmer, Washington (D. C.) gas is not far from 250, and the less said about Bay State the better. The recent exceptionally high figures in U. G. I. shares have been strongly maintained, and Philadelphia financiers say that the stock is still well under its intrinsic value.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,

PROPRIETORS.

MONDAY, OCT. 10, 1898.

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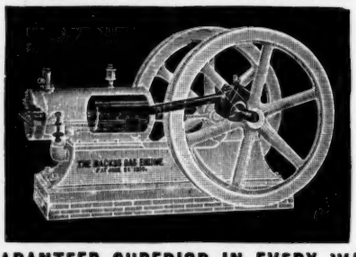

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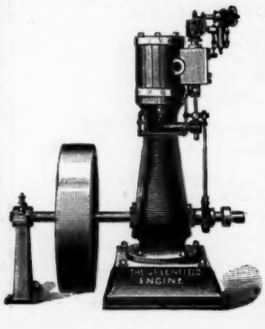

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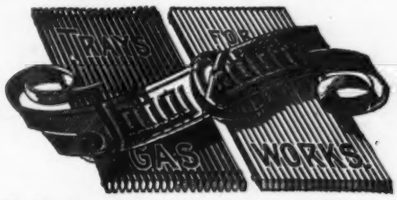


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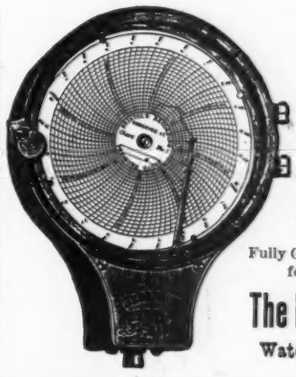

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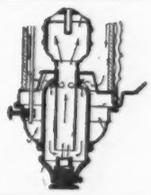

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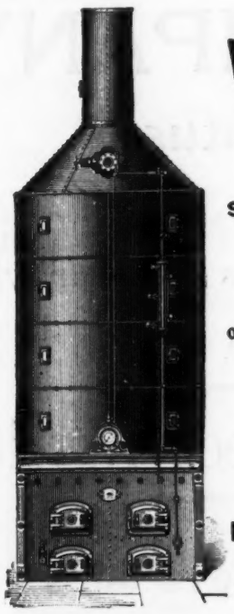

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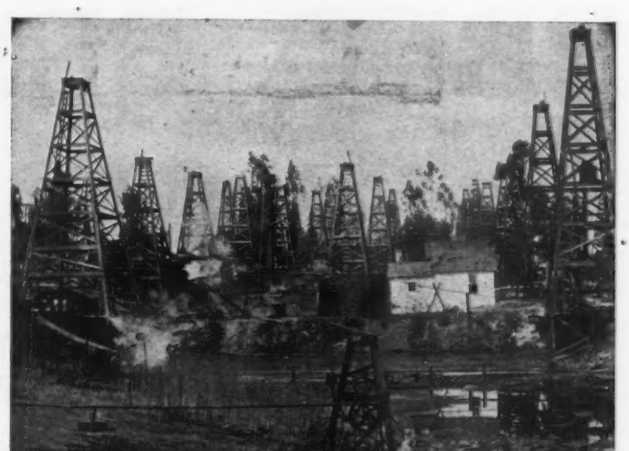

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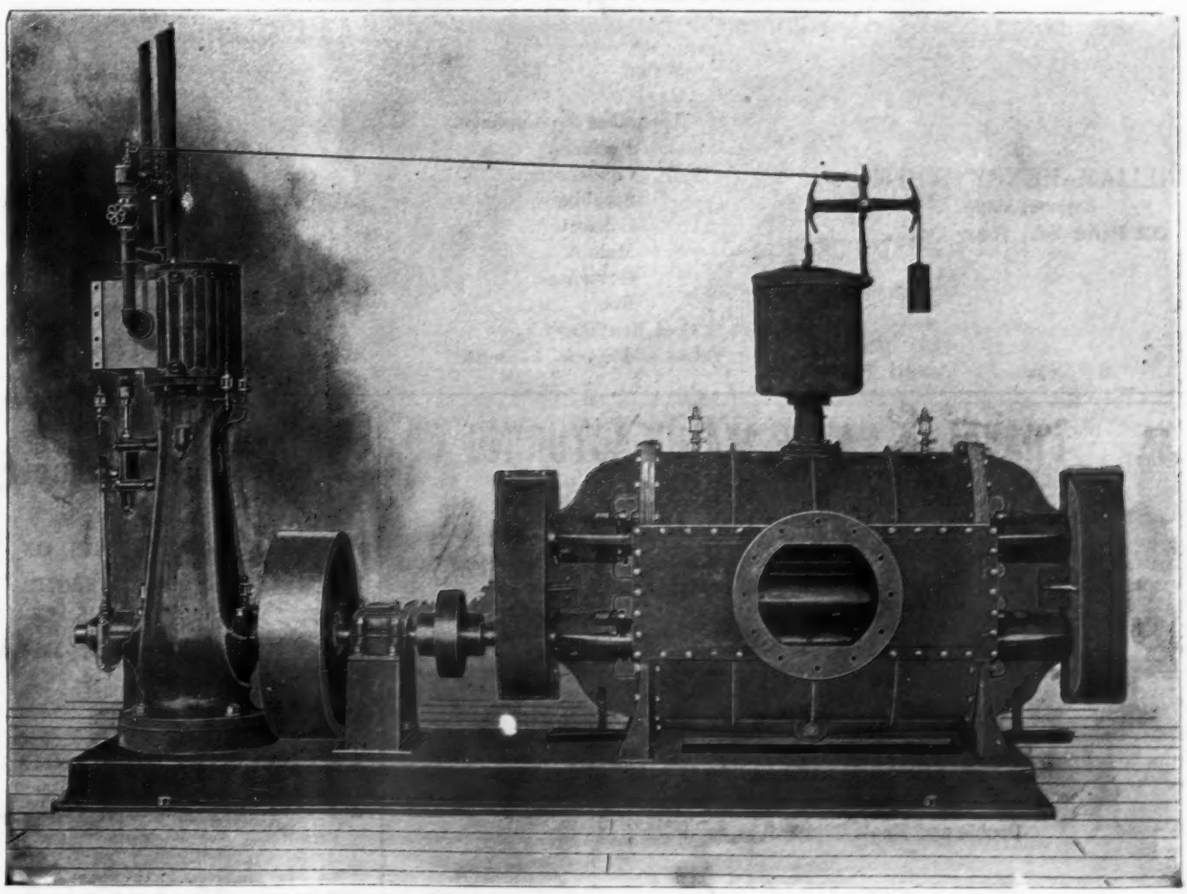

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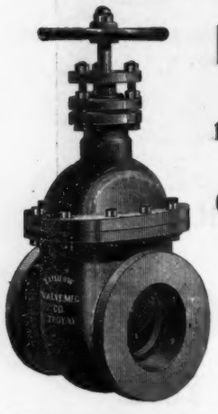

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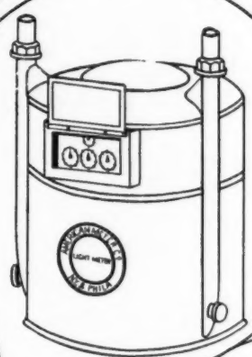

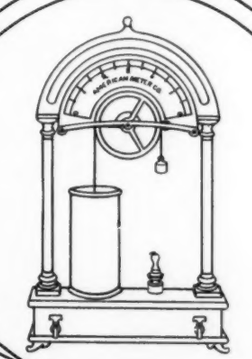

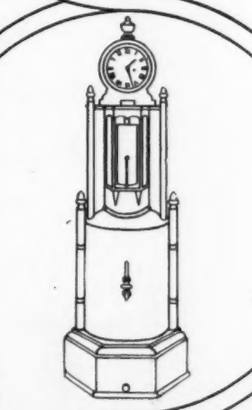

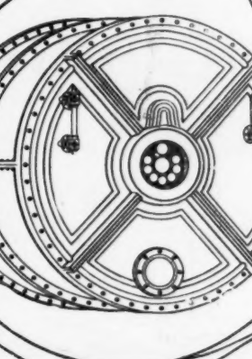

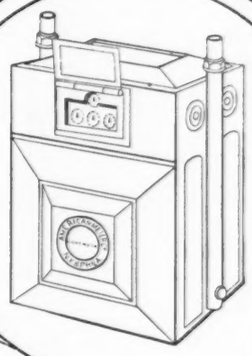

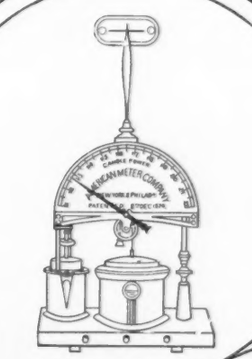

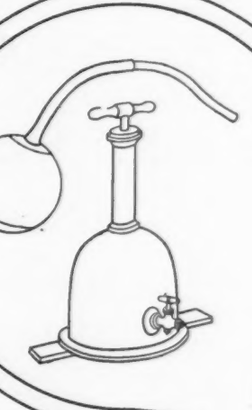

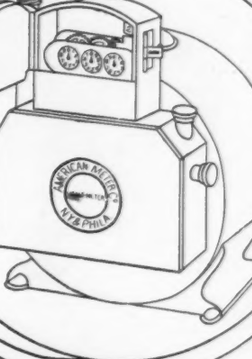

## PUBLIC LIGHTING TABLE.

### OCTOBER, 1898.

| Day of Week. | Date. | Table No. 1. Following the Moon. Light. | Extingnish. | Table No. 2. New York City. All Night Lighting. Light. | Extinguish. |
|---|---|---|---|---|---|
| | | | | P.M. | A.M. |
| Sat. | 1 | 6.10 PM | 7.10 PM | 5.30 | 5.00 |
| Sun. | 2 | 6.10 | 7.50 | 5.30 | 5.00 |
| Mon. | 3 | 6.10 | 8.30 | 5.30 | 5.00 |
| Tue. | 4 | 6.10 | 9.10 | 5.30 | 5.00 |
| Wed. | 5 | 6.10 | 10.00 | 5.30 | 5.00 |
| Thu. | 6 | 6.10 | 11.00 | 5.30 | 5.00 |
| Fri. | 7 | 6.10 LQ | 12.00 | 5.30 | 5.00 |
| Sat. | 8 | 6.10 | 1.00 AM | 5.20 | 5.10 |
| Sun. | 9 | 6.00 | 2.00 | 5.20 | 5.10 |
| Mon. | 10 | 6.00 | 3.00 | 5.20 | 5.10 |
| Tue. | 11 | 6.00 | 4.00 | 5.20 | 5.10 |
| Wed. | 12 | 6.00 | 5.10 | 5.20 | 5.10 |
| Thu. | 13 | 6.00 | 5.10 | 5.20 | 5.10 |
| Fri. | 14 | 6.00 | 5.10 | 5.20 | 5.10 |
| Sat. | 15 | 6.00 NM | 5.10 | 5.10 | 5.20 |
| Sun. | 16 | 5.50 | 5.10 | 5.10 | 5.20 |
| Mon. | 17 | 5.50 | 5.10 | 5.10 | 5.20 |
| Tue. | 18 | 5.50 | 5.10 | 5.10 | 5.20 |
| Wed. | 19 | 5.50 | 5.10 | 5.10 | 5.20 |
| Thu. | 20 | 8.20 | 5.10 | 5.10 | 5.20 |
| Fri. | 21 | 9.40 FQ | 5.10 | 5.10 | 5.20 |
| Sat. | 22 | 10.50 | 5.10 | 5.00 | 5.30 |
| Sun. | 23 | 12.00 | 5.20 | 5.00 | 5.30 |
| Mon. | 24 | 1.10 AM | 5.20 | 5.00 | 5.30 |
| Tue. | 25 | 2.20 | 5.20 | 5.00 | 5.30 |
| Wed. | 26 | 3.20 | 5.20 | 5.00 | 5.30 |
| Thu. | 27 | 4.30 | 5.20 | 5.00 | 5.30 |
| Fri. | 28 | No L. | No L. | 5.00 | 5.30 |
| Sat. | 29 | No L. FM | No L. | 4.45 | 5.35 |
| Sun. | 30 | No L. | No L. | 4.45 | 5.35 |
| Mon. | 31 | 5.30 PM | 7.10 PM | 4.45 | 5.35 |

## TOTAL HOURS LIGHTING DURING 1898.

| By Table No. 1. | Hrs. Min. | By Table No. 2. | Hrs. Min. |
|---|---|---|---|
| January | 210.40 | January | 423.20 |
| February | 186.40 | February | 355.25 |
| March | 181.20 | March | 355.35 |
| April | 166.10 | April | 298.50 |
| May | 156.40 | May | 264.50 |
| June | 144.30 | June | 234.25 |
| July | 147.30 | July | 243.45 |
| August | 157.10 | August | 280.25 |
| September | 169.50 | September | 321.15 |
| October | 186.00 | October | 374.30 |
| November | 204.30 | November | 401.40 |
| December | 218.30 | December | 433.45 |
| Total, yr. | 2129.30 | Total, yr. | 3987.45 |

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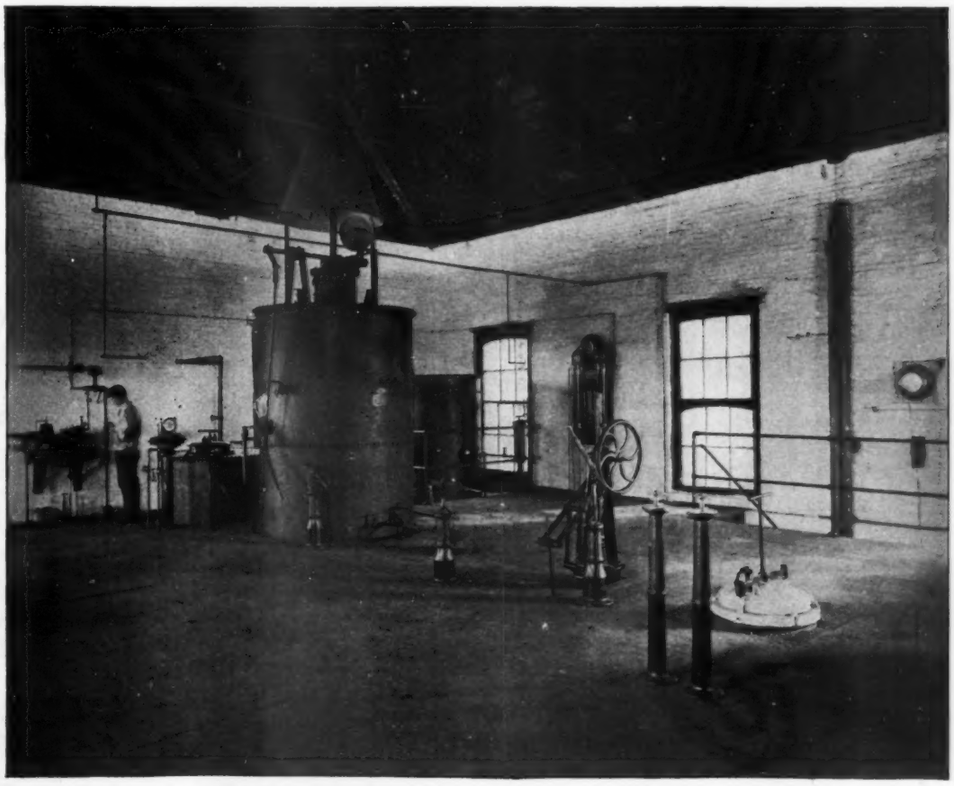

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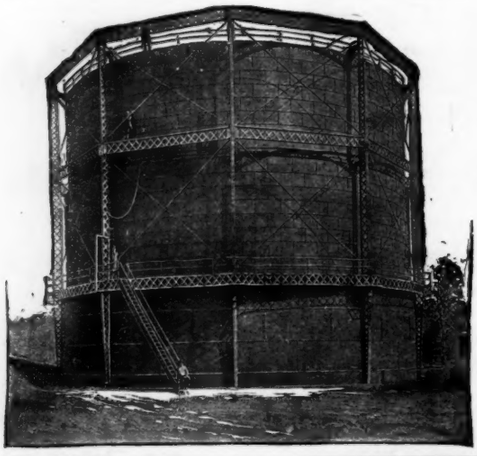

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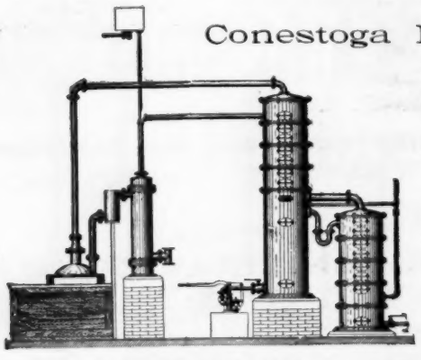

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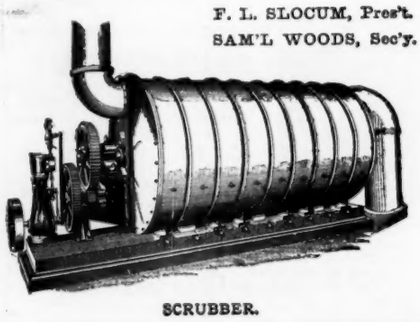

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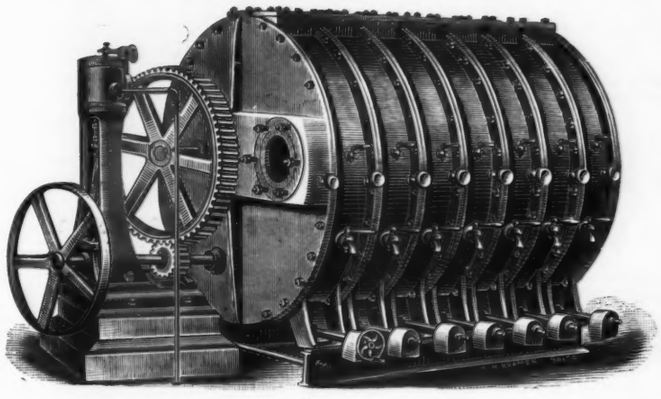

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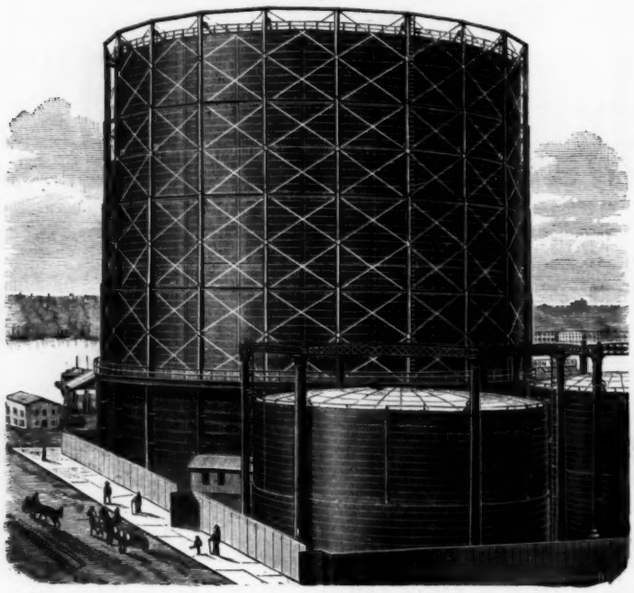

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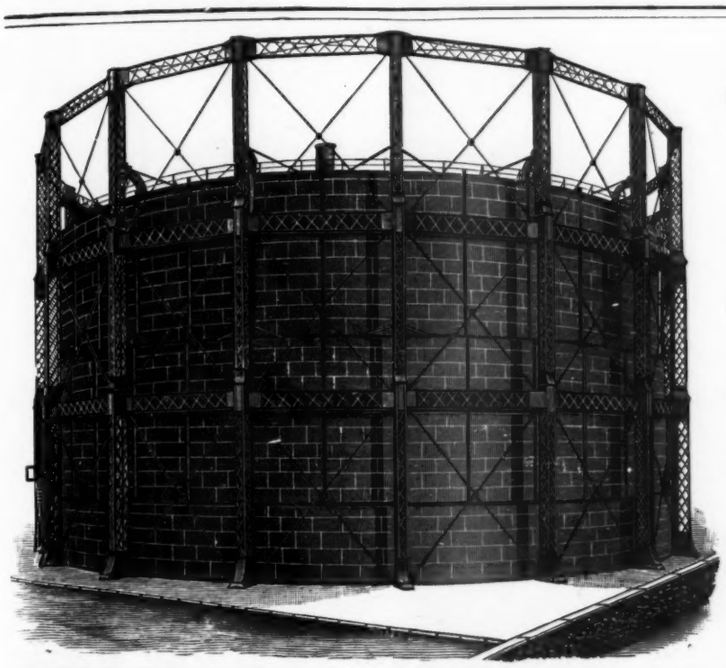

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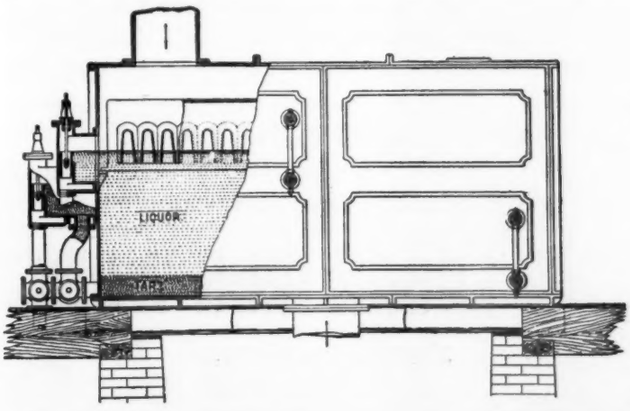


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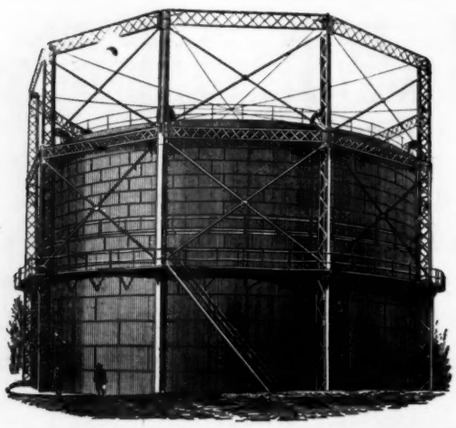

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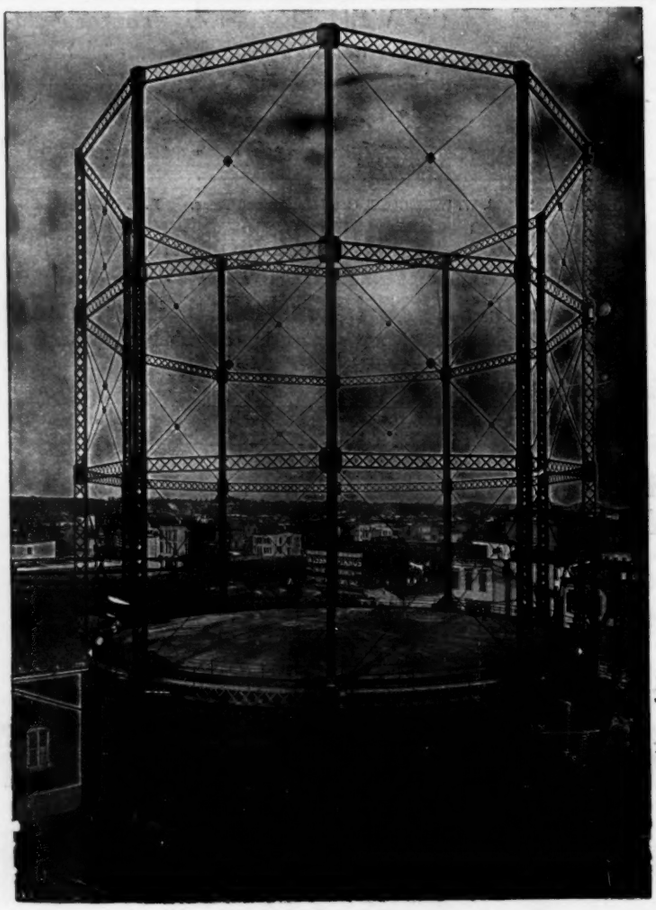
Stroh & Osius Concentrator for Ammoniacal Liquor, used by 50 Gas Companies and Cokeries during the past 4 years.

The order for this Triple-Lift Holder and Steel Tank was received by the Logan Iron Works from the Union Gas Light Company, of East New York. The contract was completed and the Holder was in actual use in 90 days from receipt of order. Capacity of Holder, 500,000 Cu. Ft.



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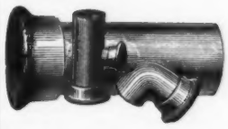

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**The amount of gas delivered for the coin can be instantly and positively changed without removing the meter or replacing any parts.**

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**Established 1849.** With the best facilities for manufacturing, is enabled to furnish reliable work and answer orders promptly.

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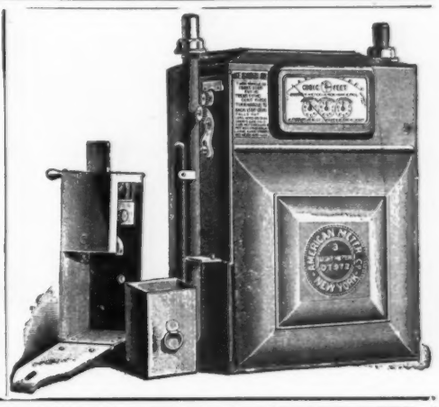
**Their construction is such that they may be readily readjusted when the scale of gas rates is changed.**



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## Wet and Dry Gas Meters, Station Meters, Provers, Gauges, Etc.

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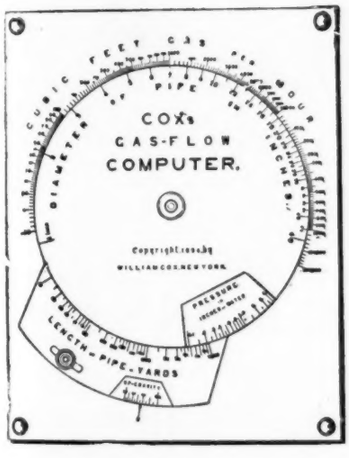
**Our Own Patents. Strong. Simple.** PROMPT ATTENTION. CORRESPONDENCE SOLICITED.

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what size of Pipe to use to convey any quantity of Gas, any distance, with any loss of pressure, and any initial or final pressure? Then use

## COX'S GAS FLOW COMPUTER,

as it gives this information accurately at sight, without mental effort. No calculations needed. Saves time, money and mistakes.

**Price, 6.5 x 8 inches, in cloth case, $2.50.**

For sale by

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## This is the best time to look after your repairing.

Seventy per cent. of old meters run slow. You are losing money on them. Let us put them in shape for you, a few at a time, until your entire meter equipment is made as good as new. It is better to attend to this matter now, before the Gas Stove season is at its height. Probably we can do such work in our factory better and cheaper than you can do it at home, and just now we can do it promptly.

**The BUHL METERS are as good Meters as you can get.**

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Nos. 1513, 1515, 1517, 1519 & 1521 Race Street, Philadelphia,
52 Dey Street, New York, 75 N. Clinton Street, Chicago,

Occupies this page every alternate week

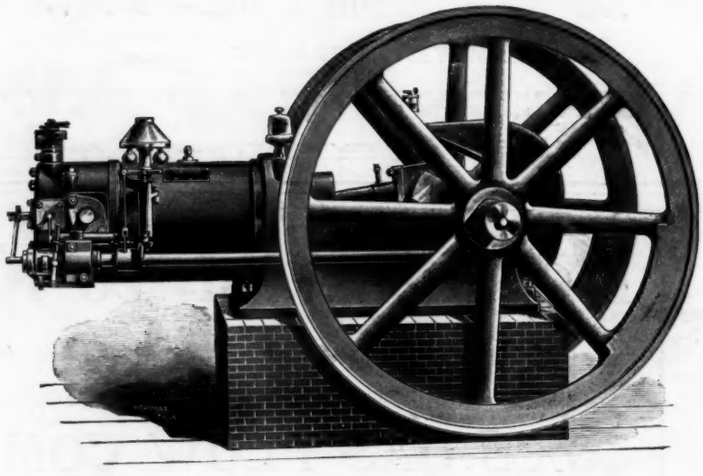
# ARE GAS COMPANIES RECOMPENSED

FOR THEIR

## EFFORTS IN FAVOR OF THE OTTO GAS ENGINE?

**Those who Wish to Know will Find an Answer in the Following Figures.**

Over 60,000 in Use.



The United Gas Improvement Company, by the lease of the Philadelphia Gas Works, derives a yearly revenue estimated at **$250,000 to $275,000** from the sale of gas consumed by OTTO GAS ENGINES exclusively in the city of Philadelphia, there being over 700 engines in use, ranging from 1 to 50 H.P.

The Gas Companies in Greater New York derive similarly a yearly income of **$300,000 to $330,000.**

A large number of small towns do, proportionately to their population, quite as well.

Have you ever actively given US any support in our efforts in YOUR behalf? If not, NOW is the time to take advantage of the present revival in business to place the OTTO before your Consumers.

**The "OTTO" is Suited for All Power Purposes.**

## THE OTTO GAS ENGINE WORKS, Phila.

NEW YORK, 39 Cortland St. BOSTON, 19 Pearl St. CHICAGO, 360 Dearborn St.